DOCUMENT RESUME

ED 031 074 EF 003 552

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Three High Schools Revisited--Andrews, McPherson, and Nova. Profiles of Significant Schools.

Educational Facilities Labs., Inc., New York, N.Y.
Pub Date Jul 67
Note-42p.
EDRS Price MF-$0.25 HC-$2.20
Descriptors-Acoustical Environment, Air Conditioning, Audiovisual Aids, *Building Innovation, *Controlled Environment, *Educational Innovation, *Facility Case Studies, Flexible Facilities, Flooring, *High Schools, Individual Instruction, Resource Centers, Team Teaching, Windowless Rooms

Three schools--Nova High School in Fort Lauderdale, Florida, McPherson Senior High School in McPherson, Kansas, and Andrews Senior High School in Andrews, Texas--are examined in this report. All of them are considered advanced educational plants, and all have been in full operation for less than five years, but most of their innovational aspects have already been thoroughly tested. Many have proven effective. Some, on the other hand, have not, and it is the purpose of this report to replay the valuable lessons that educators have learned in actual practice, informing future planners as to which features might be emulated and which avoided in the design of school buildings for the space age. All incorporate--(1) team teaching, (2) individual instruction, (3) audio-visual aids, (4) decentralized resource facilities, and (5) efficient environmental controls leading architects in the direction of flexible, multipurpose space, library focal points, full air-conditioned and carpeted buildings, greater use of acoustical materials, one-floor loft places, windowless areas, teachers' offices and planning rooms, and modern communications hardware. This document previously announced as ED 019 834. (RK)

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EFL

a report from Educational Facilities Laboratories

EF 003552

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Three High Schools Revisited:

Andrews, McPherson, and Nova

by Sherwood D. Kohn

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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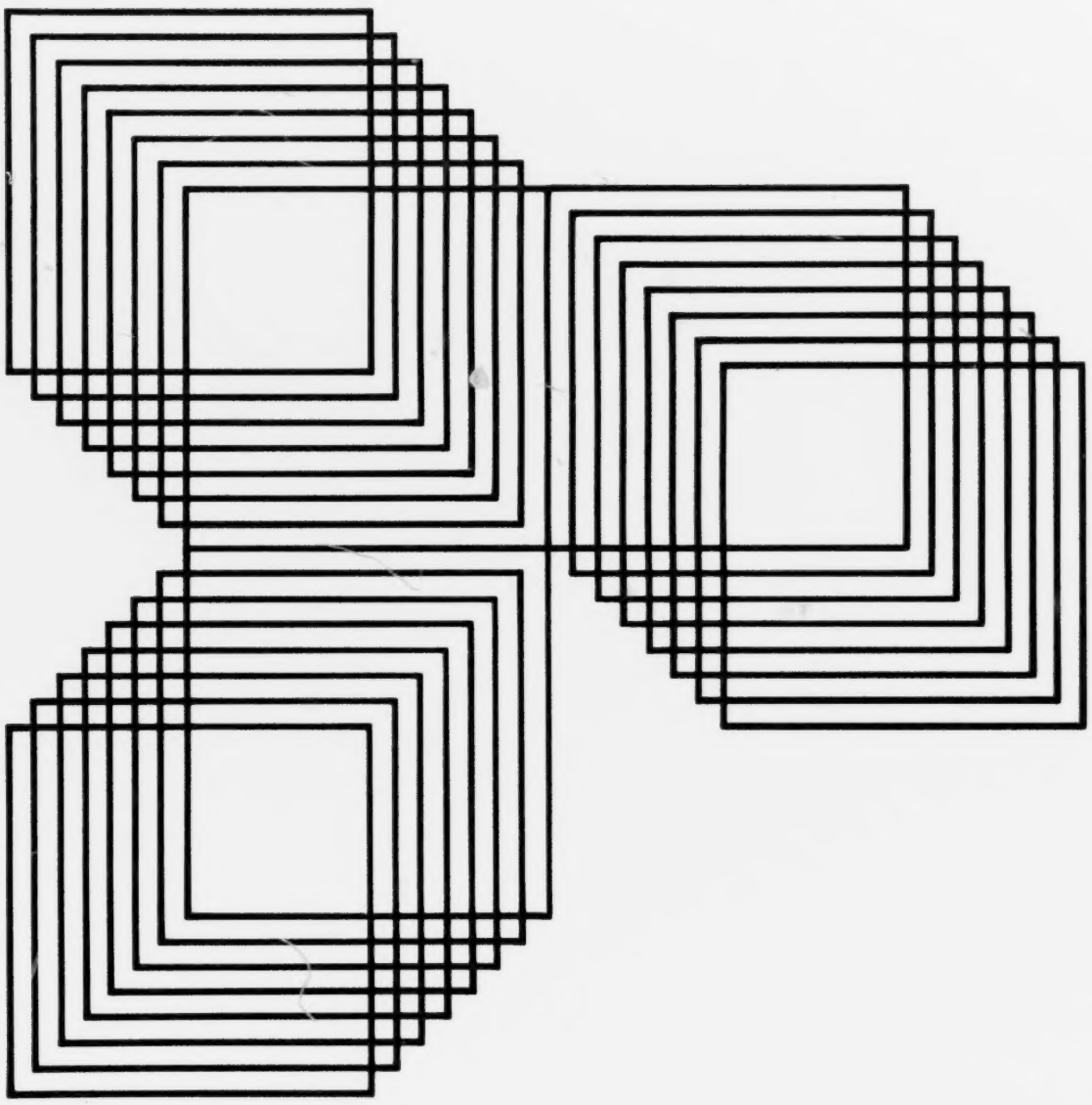


Library of Congress Catalog Card No. 67-28054
FIRST PRINTING: *July 1967*
SECOND PRINTING: *December 1967*

Additional copies are available from the offices of
Educational Facilities Laboratories, Inc.
477 Madison Avenue,
New York, New York 10022

Introduction

Three for Tomorrow

Much has been said about building schools for the future. In one respect, this continuing dialogue is symptomatic of man's deep-seated wish to influence the minds of his descendants. In another, it is evidence of his growing conviction that coming generations must be uniquely equipped to cope with a technology we have only begun to understand. "Education," states the introduction to one set of educational specifications, "must prepare the minds of students for work that does not yet exist and whose nature cannot even be imagined."

Such is the eagerness of the planners to get on with the pressing work of education, and such is their apprehension that they will be too late in designing favorable environments to nurture it, that blueprints are often praised before their completion and buildings assessed even before desks have been moved into their classrooms. Rarely are schools reported upon after they have been in operation for some time, and even more rarely are planners and administrators apprised of the effects of their advanced thinking.

Three schools are examined in this profile. All of them are considered extremely advanced educational plants, and all were reported upon generously before their doors were opened. At this writing, they have been in full operation for less than five years, but most of their innovational aspects have already been thoroughly tested. Many have been proven effective. Some, on the other hand, have not, and it is the purpose of this report to relay the valuable lessons that educators have learned in actual practice, informing future planners as to which features might be emulated and which avoided in the design of school buildings for the Space Age.

All three schools—Nova High School in Fort Lauderdale, Florida; McPherson Senior High School in McPherson, Kansas; and Andrews Senior High School in Andrews, Texas—were built with a definite, and roughly similar, educational philosophy in mind. The concept of team teaching, combined with those of intensified individual instruction, increased use of audio-visual aids, decentralized resource facilities, and efficient environmental controls, has led architects in the direction of flexible, multi-purpose space, library focal points, fully air-conditioned and carpeted buildings, greater use of acoustical materials, one-floor and loft plans, windowless areas, teachers' offices and planning rooms, and provision for a wide spectrum of modern communications hardware.

All three schools are inward-looking, focused on libraries and resource centers, none is equipped with the traditional single-purpose type of auditorium capable of seating an entire student body at one time, cafeteria space is minimized or rendered multi-purpose in varying degrees, and zones of high noise-level activity are isolated from areas in which uninterrupted study is of primary importance.

In all three, economy of space, zoning of related activities, and ease of traffic flow have been basic requirements, and the measures taken to achieve these assets have led naturally to savings in construction and

maintenance costs. In each case, these expenses were held to a level equal to or lower than those of more traditional, non-air-conditioned school buildings erected in nearby areas at approximately the same time.

As much as they are alike in basic educational philosophy, Nova, McPherson, and Andrews High Schools vary widely in their approaches to it. Andrews, the work of architect John Lyon Reid, is devoted to the amenities, as well as the necessities of a good learning environment. With its central domed concourse, its glassed-in library, and its fully carpeted floors, it is meant to relieve as well as dignify the serious work of education. It is, more than anything else, a kind of enclosed educational mall, hushed in tone, comfortable for its occupants, and glowing with a uniform interior light.

McPherson High School, designed by John A. Shaver, is the most inward-looking, a cluster of hexagons linked with a circle; perhaps the least flexible of the three on a day-to-day basis, it is the most readily expandable. McPherson seems the warmest, most intimate building, better adapted for materials resource centers than Andrews, not as decentralized as Nova, and certainly the most compact of the trio.

Nova, the work of James M. Hartley, is centered on an open pavilion, a point of adaptation to the subtropical climate of Southern Florida. In essence, it is a blend of controlled learning environments and outdoor leisure areas. Perhaps more important, it is the only school of the three in which a full program of team-taught, nongraded class scheduling is supported by completely decentralized library facilities and a sophisticated network of information retrieval and communications hardware.

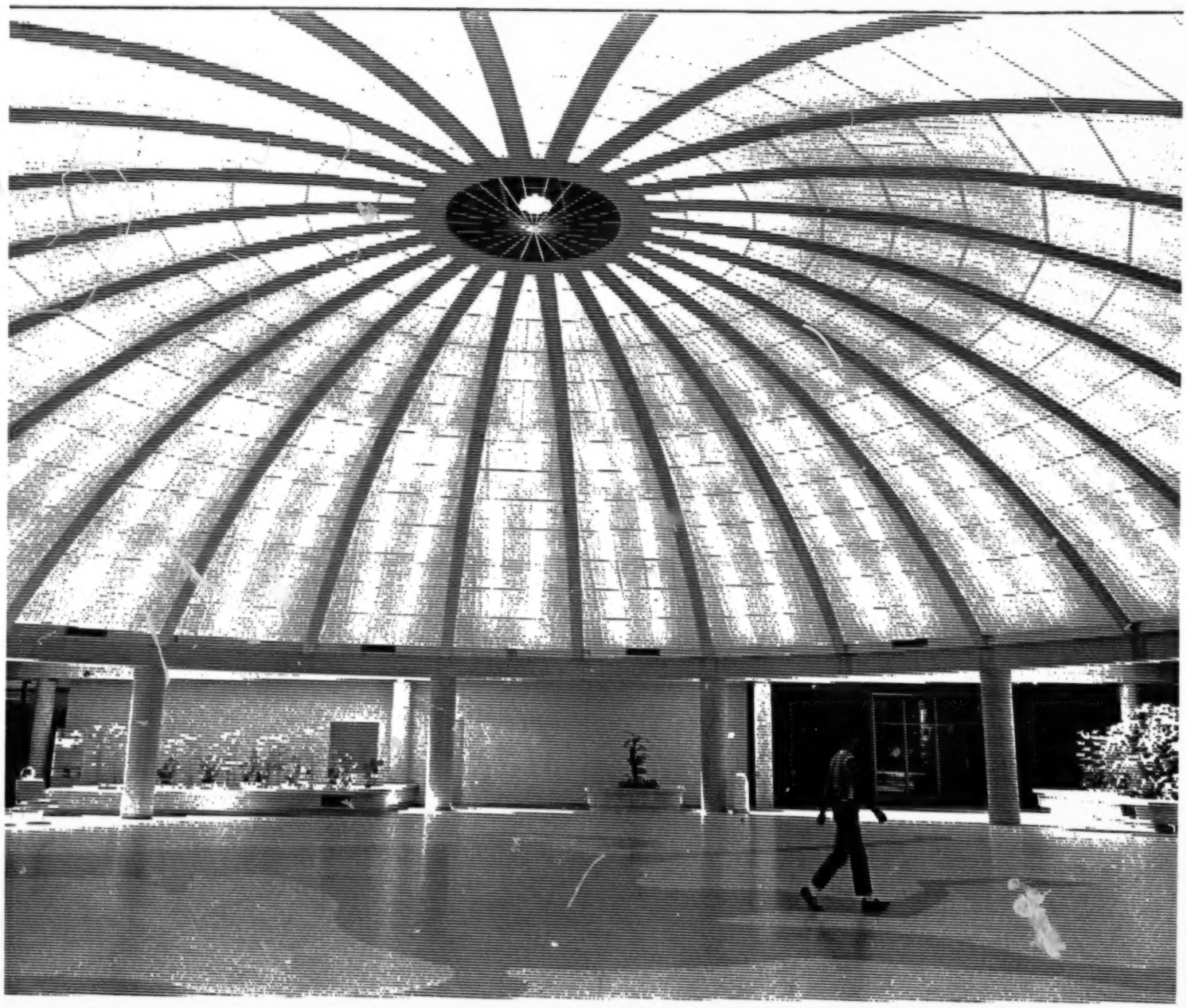
The schools seem well suited to their environments. Andrews' enclosed concourse is designed to provide the gracious space of an atrium while shielding its occupants from the high winds, dust storms, and climatic extremes of west Texas. Nova's pavilion affords a student commons, sheltered from the hot Florida sun, that provides a crossroads between its four centers of learning. It is rather like Andrews' concourse, but adapted to the outdoor patterns of life in a resort area. McPherson is a structure for more temperate climes, a controlled environment having little intercourse with its surroundings, a building self-centered and self-sufficient, a beehive that is varied as well as compact.

With all of their innovations, however, Nova, McPherson, and Andrews have one essential factor in common with even the most conventional schoolhouse. Educationally, they are effective in direct proportion to the motivations of teachers and students.

School buildings perform their most dynamic functions as catalysts. Their individual conveniences, efficiencies, and assets as a learning environment are less significant than their roles as fulcrums of separation from the past, encouragers of the experimental spirit, instruments of propinquity for people and their tools.

In the end, a school building itself is merely a tool, a tool which can only be as useful as its designers and users are skillful and highly motivated.

Andrews:



ANDREWS SENIOR HIGH SCHOOL, ANDREWS, TEXAS

Andrews, Texas, may be the only town in the United States where the local chamber of commerce features the community's senior high school on the cover of its promotional brochure. But then, Andrews Senior High School is not only the largest, most advanced, and most complex structure in town, it is the focal point—physically, intellectually, and perhaps even emotionally—of this oil field settlement in west Texas. In a way, the high school is the epitome of Andrews' social aspirations, an embodiment and culmination of the community's spirit, an important center of cultural activity, and a significant expression of a basic conflict in American attitudes, i.e., the willingness, even eagerness, to accept or attempt technological advances while holding tenaciously to conservative and traditional feelings toward intellectual inquiry.

As towns go, Andrews is a new community. Established in 1910, on the high (altitude 3,410 feet), flat, semi-arid (average annual rainfall, 15 inches), oil-rich plain of the Permian Basin, 108 miles southwest of Lubbock, it is named after Richard Andrews, a hero of the Texas Revolution.

As oil fields go, the one surrounding Andrews is middle-aged. There are few new wells—one sees only an occasional drilling rig on the unmoving sea of red sand-clay and pale mesquite—and the land seems endlessly punctured by green, birdlike reciprocating pumps that dip their bills, day and night, into a slowly dwindling pool of prehistoric resources.

Andrews' changes over the last 50 years have been largely physical. Its population has grown phenomenally—from some 700 in 1940 to 11,135 in 1960—it has a new city hall, a new hospital, and a modern county courthouse, all built within the last 10 years, and it boasts a school system, developed under the administration of Superintendent T. A. Roach, who is now retired, that spends an average of $795 per pupil—$262 more than the national average and $345 more than the average for Texas—on educating a school-age population that grew from 280 in 1942 to 3,233 in 1962 and is still growing.

Despite its prodigious growth, Andrews has very few permanent residents. With oil comprising 97 per cent of the town's economic base, and most of its breadwinners employed by oil companies, Andrews' population is highly mobile. To be sure, the turnover has lessened somewhat in recent years, but the annual rate among residents is still between 10 and 15 per cent. It is estimated that the typical Andrews family remains in the community for only three or four years (about half the people in the United States move every five years), and there are not more than six teachers in the school system who were educated in it.

The same factors that have produced this transience also make Andrews a relatively well-to-do community. Located at the center of a 10-county area that produced more than four billion barrels of oil in 1960, it is the richest oil-producing spot in the United States, yielding its billionth barrel of crude last year. The effective buying income of Andrews, reported by a 1964 Sales Management "Survey of Buying Power," was $29,159,000. A per-household buying income of $6,781 is the highest in Texas.

Andrews has two and a half oil wells for every child in the school system, a statistic that prompted Superintendent Roach to remark that it's just as easy to teach in a system that has two and a half oil wells per child as it is to teach in one that has none.

The combination of Andrews' wealth, the relative youth and ambition of its people, and the expansile character of its population has resulted in a highly ambitious school building program, motivated by the desire—in traditionally magnanimous Texas style—"to get the best that money can buy."

This was, in fact, the very attitude that preceded the building of Andrews Senior High School. Between 1955 and January, 1962, Andrews built a new junior high school, five 2-room primary school buildings, three 16-room elementary schools, an 8,400-seat football stadium, and a new administration-curriculum center for the school system. In addition, a cafeteria, student lounge, and little theater were added to the junior high school in 1957, and considerable remodeling was done to buildings already in existence.

After it was determined in 1958 that the population explosion would soon render Andrews' old senior high school building obsolete, the city fathers cast about for a proper expression of the community's educational desires. There were some who felt that these desires were colored by the paternalism of the town's real patrons—the oil companies—whose executives tend to regard Andrews as an outpost of empire, and look upon its facilities, educational and otherwise, as being in the nature of employees' fringe benefits or inducements to remain in the organization.

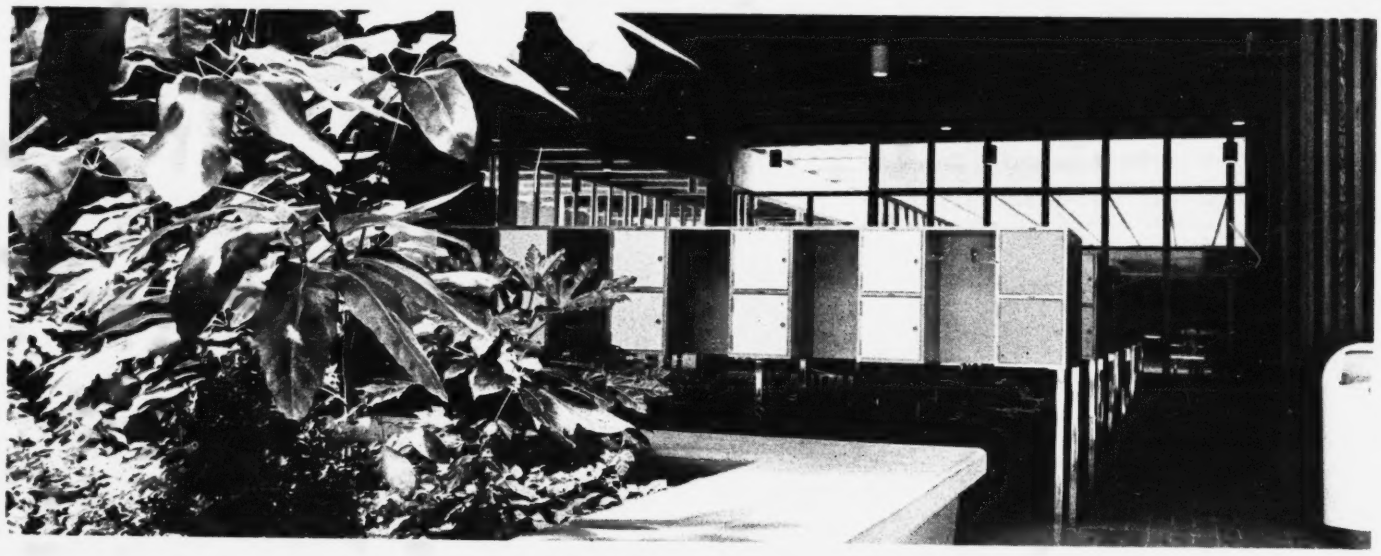
Before Andrews Senior High School was built, an 18-member lay advisory council, drawn from representative segments of the community, called in education experts from the University of Texas, the University of Wyoming, and Columbia University, among others, and hammered out their requirements over a two-and-a-half-year period. It was decided that the high school program—comprehensive in nature—should be determined first, after which available funds would be estimated, and finally, that a school should be constructed according to the needs of teachers, administrators, and above all, a specific student body. John Lyon Reid, a San Francisco architect with a history of pioneering work toward new and better answers to educational problems, was engaged to design the building and worked with the council for a year and a half before drawing up the plans for Andrews Senior High School.

It was Reid's aim to design a high school that would provide an "environment of respect," a structure that would be flexible enough to permit varying instructional concepts and afford ample space and facilities for varying interior arrangements; one that would be light, strong, fire-resistant, dignified, and aesthetically pleasing; a building that would be economical to build and maintain, but be easily expansible to accommodate an expanding student body; an edifice that would create its own climate of physical, emotional, and intellectual comfort and efficiency, independent of surrounding conditions; and finally, to give Andrews a schoolhouse that would compete with other local facilities, both civic and commercial, for the time and energies of students and townspeople alike.

In his design for Andrews, Reid also intended to explore the virtues of air conditioning, loft planning (which he had already tried in a quartet of loft schools in San Mateo, California), and the use of carpet as a method of acoustical control.

The idea of carpeting classrooms was not entirely new to Andrews. In 1957, the school district agreed to allow the American Carpet Institute to install carpet, at no cost to the system, in Peter Pan School, one of the five two-room primary units designed by Caudill, Rowlett and Scott. The experience was so favorable that Andrews, after studying the matter further under a small EFL grant, decided to try carpeting throughout its new high school.

A fully carpeted, loft-plan building, focused on a circular, domed concourse and



completely sealed from the vagaries of its surrounding environment, was the result of Reid's thinking. The new, $2,900,000 Andrews Senior High School, opened in January, 1962, on the northwest edge of town, lies flat against the prairie. Its level, 4½-acre roof is supported by prestressed concrete beams floated on poured concrete columns; its red brick curtain walls are relieved by windows or vision strips every 30 feet and at the corners. The silver dome, over the concourse in the east, or main, wing of the school, affords the only break in the straight lines of the roof, and the general impression of the building's exterior is one of almost Oriental severity.

The interior is another matter. One enters through wide doors on the north to a shallow corridor lined with a profusion of tropical foliage. Directly to the front, behind the plants, lies the glass wall of the library enclosure. Off to the left opens the gray-white terrazzo of the concourse, uncluttered space rising to the pleasant, converging curves of the lighted dome, and further on, beyond the concourse and its surrounding red tile floor, is the cafeteria—a cool, shaded area filled with tables and chairs and giving the impression of contrasting depth.

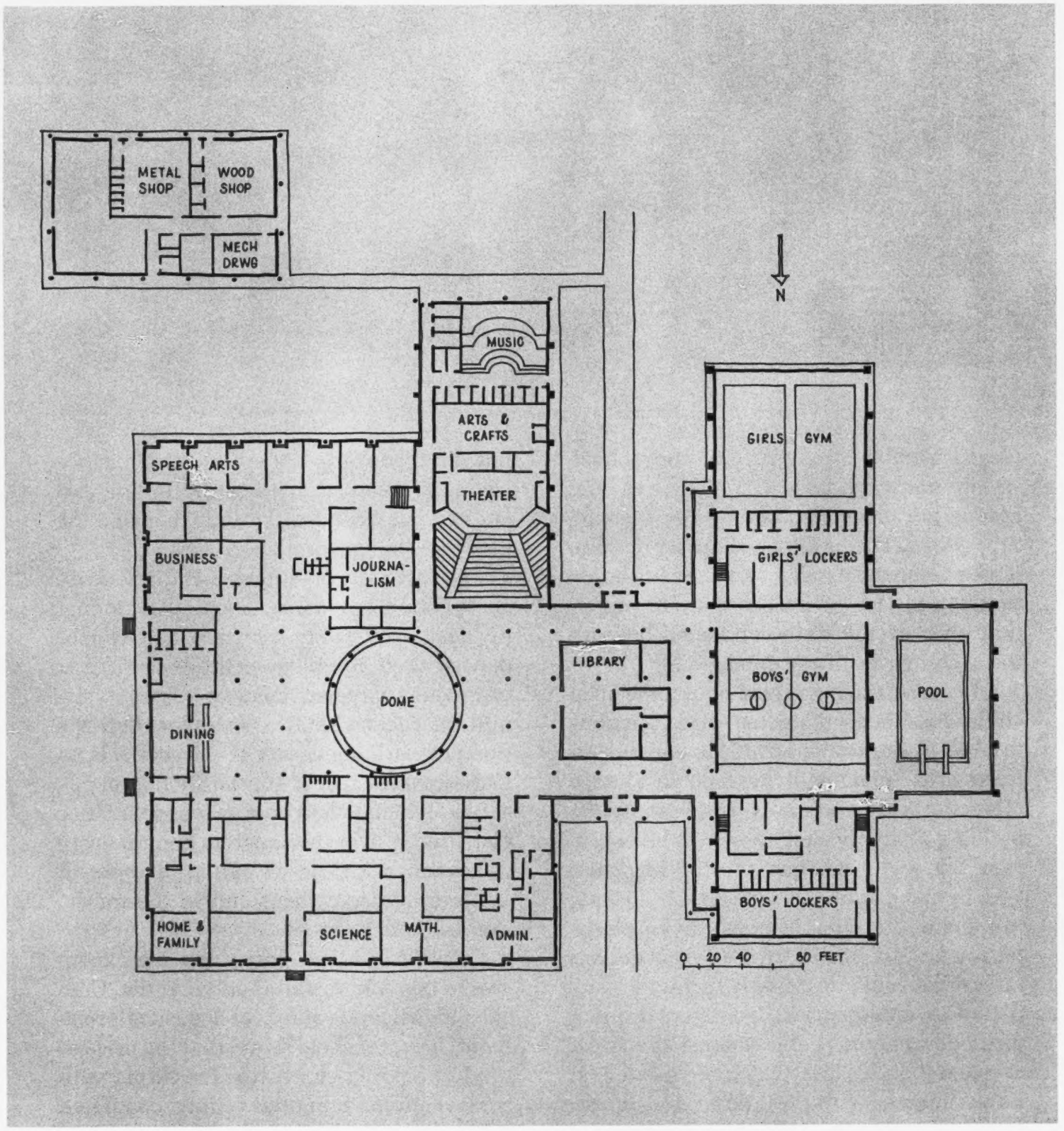
In the other direction to the right of the library, stands the glass wall of the gymnasium, through which the glassed-in swimming pool on the east wing of the building can be seen glinting in the sun. The effect, as the present school superintendent, Dr. Robert A. Montgomery, has remarked, is rather like that of a shopping center mall, but quieter, more comfortable, where the student may find intellectual stimulation, peace for contemplation, and the incentive to quest for knowledge.

The domed concourse is Andrews' principal grace. Through its use, Reid has virtually eliminated the noisy, wasteful corridors that connect classrooms in conventional structures, and has given his school a lightness and sense of freedom that might have been achieved with an atrium.

An atrium, however, would have been impractical at Andrews. The climatic extremes of west Texas—the high winds of both summer and winter, and the intrusive sand storms of March, April, and May—dictated an entirely enclosed building that would provide its own climate. The dome insures this and offers an opportunity for tall foliage, planted under skylights at four points of the circle.

But the open space of the rotunda has many other practical advantages. Primarily, it eliminates the necessity for a large, infrequently used auditorium or assembly hall, since school functions can be mounted under the dome by the simple expedient of setting up a portable stage or lectern and bringing in folding or stacking chairs, which are stored in a small room adjacent to the rotunda when not in use. Brodie Hutchinson, Andrews' principal, says that the assembly area can be prepared in slightly more than an hour's time to seat approximately 800 to 900 students.

Moreover, the concourse can be em-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ployed flexibly, not only by the school, which normally uses it for dances and graduation exercises, but by the community as well. The Andrews Chamber of Commerce frequently holds banquets in the rotunda, and last year more than 10 important civic events were conducted beneath the arching ribs of the dome.

Of course, during school hours, the open circle—82 feet in diameter—also functions to concentrate student traffic in one uncluttered area, making it possible to change classes quickly and easily, or to empty the building in a very short time. On one occasion, this writer has seen the building emptied in three minutes flat. To be entirely fair about it, it must be noted that each department area has its own exterior door, a factor that could immensely facilitate evacuation in emergencies. However, the majority of students prefer to cross the circle to reach their lockers, which are located on its perimeter, at the southeast and northwest corners of the surrounding tiled area, and to leave through the main portals at a fast walk.

Most teachers are enthusiastic about the concourse. One of the main reasons for this enthusiasm is the fact that extensive monitoring of the building during lunchtime is unnecessary. When classroom areas are vacated for lunch, no student is permitted to remain in them, but otherwise pupils have the freedom of the building, including the library and the gymnasium, and the noise level is surprisingly low.

The acoustics of the domed area are live, but not disturbing beyond the circle, since sound is absorbed by the surrounding carpet and the fiberglass battens that line the concrete ceilings of all corridors.

The loft plan of Andrews High School's classroom areas, their "open" partitioning by means of easily movable hollow-door panels, their luminous ceilings, and their completely carpeted floors, are the most significant factors in Reid's design. Perhaps the most striking aspect of the school is its 34,805 square feet of quarter-inch wool pile carpet, which is laid on a 48-ounce all-hair pad directly over the concrete floor in every classroom, with the exception of those in the science department and in the music, arts, and crafts areas.

Considered alone, carpet is more expensive to buy and install than vinyl tile. Considered in a total context of acoustical treatment, however, Reid found that the price of the low-bidding contractor for carpet with a conventional luminous ceiling, compared with vinyl tile plus an acoustically treated luminous ceiling, was the same—$41,000, or $1.18 a square foot. Moreover, the acoustical properties of the carpet permitted other savings—a total of from $4,000 to $6,500 in sound-absorbing materials—and allowed Reid full freedom in the use of doorless classroom bays, separated from each other by hollow core natural wood panels splined together to a height of seven feet with glass above.

Furthermore, it is estimated that the savings in maintenance alone will pay for Andrews' carpet in 7 to 10 years. Former

Superintendent Roach has pointed out that upkeep costs for carpeted areas are 50 per cent less than those of uncarpeted areas and that the savings in man-hours are 25 per cent higher. The actual tasks are quite simple. At Andrews, custodians vacuum the rug with ordinary household uprights, preceded by a pile-lifter in hallways, and supplemented by a two-horsepower cleaner during sandstorm seasons. A dry foam cleanser can be used periodically during the school year, and the entire carpet can be shampooed in a short time during summer vacation. In 1965, carpet cleaning supplies for Andrews High School cost a grand total of $55 for the year.

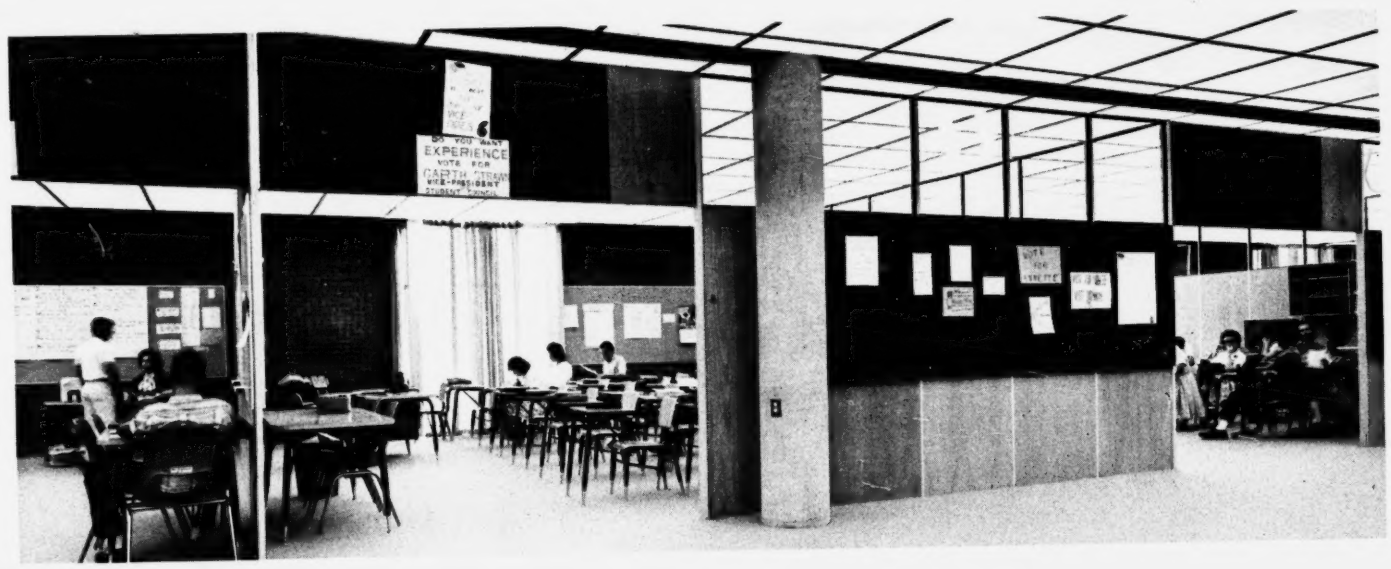
Admittedly, part of the carpeting's economy at Andrews derives from the advantages of full air conditioning and pressurization. The carpeted areas are also a considerable distance from the school's main entrances. These factors contribute to a minimum of soil on the floor covering, and consequently to less wear. There have been, and will continue to be, substantial savings in the basic costs of acoustical treatment and maintenance. This is directly attributable to the use of carpet rather than tile.

The effect of the carpet on the people who use Andrews High School is difficult to measure, but there is little question that reactions have been almost universally favorable. Teachers say that they are less legweary at the end of a day, parents claim that their children have had fewer allergic reactions to airborne dusts (of course, the air conditioning is an important factor in eliminating such contaminants), library use-frequency has improved markedly over that noted in the old high school, there is no littering or vandalism in the carpeted areas (there is some in uncarpeted areas, such as the locker vicinity), student appearance has improved, and general behavior is more dignified and respectful.

Obviously, many other factors enter into these changes, but it seems more than likely that Andrews' carpeting contributes much toward a pleasing and comfortable environment—one in which students are likely to benefit from an intensified, self-directed program of instruction.

Some lessons about carpeting, however, have already been learned at Andrews. While the carpet shows no wear in classrooms, corridors, or wide bay-access spaces, it does seem to be breaking down wherever student traffic converges, such as at the doors from classroom corridors to the concourse, and at the doors of the library. Glenn Rex, Andrews' district director of school properties, recommends that such places be made wider and feels that a simple easing of traffic concentrations would solve the problem.

Moreover, it has been discovered that metal chair legs and casters tend to leave rust spots on the carpets, a problem that can easily be solved by using plastic caps and coasters. Initially, static electricity caused some annoyance and amusement, but the novelty has worn off. Anti-static agents are available to reduce charges on carpeting, but Mr. Rex has not felt that the



problem is serious enough to warrant treatment. Besides, a simple rise in the humidity level is enough to minimize the nuisance.

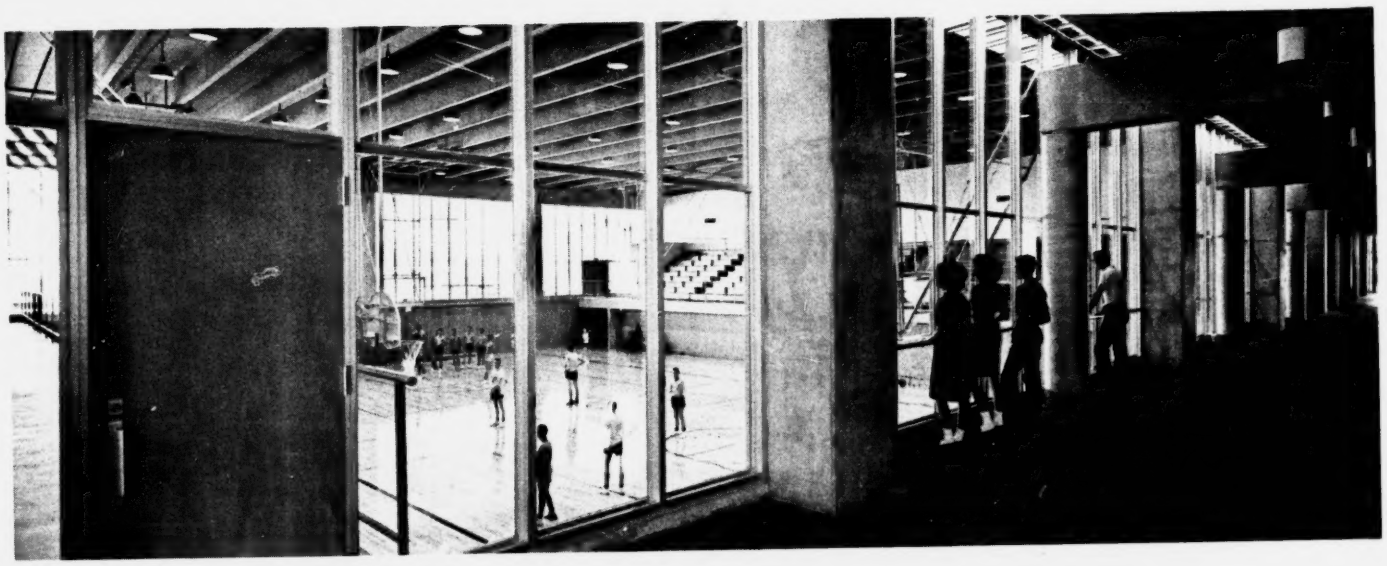
The success of Reid's open planning experiment at Andrews depends heavily on the carpet. A 1963 study of the acoustical environment of school buildings, conducted by Reid and acoustical engineer Dariel Fitzroy, found that while noise reduction between classrooms at Andrews was low, sound reverberation—a key factor in producing a feeling of quiet in any environment—closely approximated optimum conditions. The result was that 93 per cent of the teachers polled at Andrews High School rated classroom acoustics good to excellent, and none found them unacceptable.

Not that Reid's minimal separation of classrooms has been devoid of problems. To begin with, his original design, which called for a six-inch space between the bottoms of partitions and the carpet, was changed at the request of the faculty. The partitions now extend all the way to the floor covering. J. Lee Smith, who was principal of Andrews when it opened in 1962, explained that teachers and administrators felt the sight of detached legs belonging to people and furniture on the other sides of partitions would be distracting, and that mischievous students might be tempted to pass objects back and forth through the spaces.

On the other hand, the nine-foot access openings of the bays have had no adverse effect and are even conducive to increased student concentration. For example, in the traditional type of enclosed classroom, when someone opened the door during class sessions, everyone in the room looked up. At Andrews, few students are distracted by the frequent visitors, and the passage of traffic in the corridors causes no disturbance within the bays.

Obviously, the noise-deadening effect of the carpet plays a major role here, and the continuous hum of the air-conditioning system masks many sounds that would otherwise be distracting. The very noise of routine classroom discussion, which produces a steady undertone of background sibilance, tends to increase attentiveness. Still, there are some acoustical and visual drawbacks. Both teachers and students say that the use of sound equipment—record players, film projectors, etc.—in an adjoining bay is disturbing. Visual problems have been partially overcome by the use of a screen and projector which can be mounted on a mobile cart, an expedient which has also eliminated the need for completely darkening a bay. In those instances where teachers have found it necessary to darken their rooms frequently for films or slides—notably in the science department—the glass panels above the wood partitions have been screened with drapery or with ordinary brown wrapping paper.

The luminous ceiling at Andrews Senior High School has been a mixed blessing. On the asset side, its translucent plastic, suspended continuously beneath fluorescent tubing, has afforded easy maintenance and served as an efficient light source. On the liability side, students, teachers, and ad-



ministrators who work in interior areas (the exterior rooms have the benefit of some natural light from floor-to-ceiling vision strips) complain that the luminous ceiling is actually too efficient, since it provides such evenly distributed illumination that there are no shadows to relieve the eye. They find such light is monotonous and feel it produces eyestrain. To date, Principal Hutchinson has not solved this problem, although he admits that it may become necessary to install auxiliary light sources in some areas to relieve the monotony.

In general, the innovational character of Andrews Senior High School has been highly beneficial. The cost of the building—$12.56 a square foot, as compared to $20.21 a square foot for the new junior high school—was quite low. Its five-foot utility space, underlying the floor slab throughout the building, not only makes water pipes, electrical conduits, heating and air-conditioning ducts, pumps, and waste drains easily accessible, but contributes significantly to the structure's fire-resistant qualities by eliminating potential overhead draft tunnels. Andrews' fire insurance rate of 18 cents per $100 is among the lowest in a town that is extremely fire-conscious.

As Reid had hoped, his school's self-contained environment, excellent acoustical properties, dignified efficiency, pleasant surroundings, and easily maintained aesthetic assets have been deemed successful in reducing dropouts and truancy, inducing better behavior patterns, improving library use, virtually eliminating vandalism, minimizing fatigue and absenteeism, raising grades, and creating an over-all "environment of respect."

Moreover, the new building has become a genuine center of civic and academic activity. Lowell McGee, Andrews' assistant superintendent of schools, estimates that about half of the high school's student body remains in the building until 5:00 P.M. on weekdays, engaging in extracurricular activities. The swimming pool is opened to the public on Thursday evenings, the city basketball league uses the gym for practice sessions as well as tournaments, square dance clubs meet in the gymnasium on Tuesdays and Thursdays, and adult education classes are held in the building three nights a week. During the summer, the high school's facilities are employed as part of a two-month recreational program for children throughout the entire town, and summer school sessions are offered to the high school students for makeup and accelerated programs of study.

While Andrews' new senior high school is employed for many conventional purposes, full use of the building's capacities has not yet developed. The feasibility of closed-circuit television is under study, but it has not been attempted, although the physical arrangement of the school is easily adaptable for television circuitry. A decentralized library program has not been deemed practical because of the difficulty of keeping accurate book inventory records. The movable classroom partitions have not been moved, and the little theater has not

been available for large-group lectures or team teaching, because crowded conditions have made these spaces necessary for regular classes. Assistant Superintendent McGee explains that part of the reason for this status quo is that the school "was designed for built-ons, not built-ins."

And building-on is just what lies ahead. A new classroom wing, embodying a choir area and four or five practice rooms, a speech department with an office, library, stage and four practice enclosures, and a general area divided into four classrooms, has already been planned and $120,000 appropriated for its construction, which is now under way. Reid's architectural firm is not designing the annex.

Aesthetically, Andrews Senior High School seems to be quite successful. Dr. Joseph W. Tidrow, Chairman of Curriculum and Foundations in the Department of Education at Lubbock's Texas Technological College, who was the director of curricula under Dr. Roach, believes that the new school has fostered a wholesome environment that encourages unity, pride, and a kind of open personality within the student body. But even freedom and space have their drawbacks. Dr. Tidrow has suggested that the space be relieved by portable decorative objects, such as mobile planters or movable fountains, that would serve to attract those students who might otherwise avoid the openness of the circle for their leisure time activities.

Efforts are being made to develop innovations in the traditional high school program, such as "quest-centered" science programs, a senior seminar problems course in social studies, experimental remedial English classes, and advanced composition courses in the Language Arts. Students in the elementary schools, where quest-centered programs are being followed, may find more opportunity to break with tradition at the high school level.

Eventually, it is hoped, the mere physical fact of Andrews Senior High School, an environment that lends itself pleasantly to change, will help to alter the old patterns of oil-field society. Certainly the catalysts of quality have been introduced.

Andrews

LOCATION:
Andrews Independent School District, Andrews, Texas

OPENED:
January, 1962

GRADES:
9-12

CAPACITY:
1,180 students

ENROLLMENT AT OPENING:
800 students

ENROLLMENT AT TIME OF REPORT:
950 students

SUPERINTENDENT:
Robert A. Montgomery

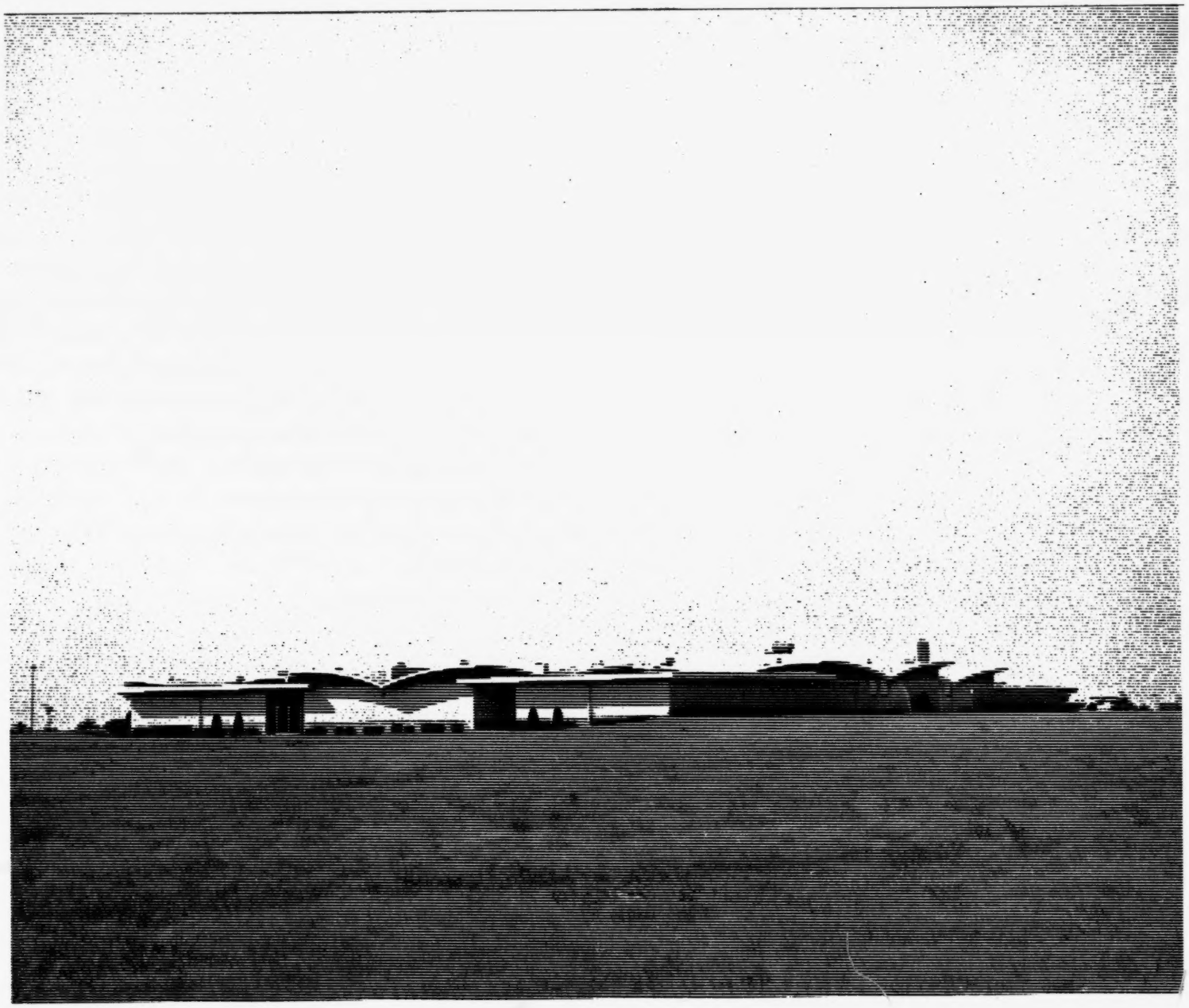
ARCHITECTS:
Reid, Rockwell, Banwell and Tarics, San Francisco, California

DESIGN:
Robert F. Olwell, John E. Coyle

ACOUSTICS:
Dariel Fitzroy

EDUCATIONAL CONSULTANTS:
Drs. Glenn Barnett, William Barron, Wayne Taylor, The University of Texas

McPherson:



McPHERSON SENIOR HIGH SCHOOL, McPHERSON, KANSAS

During early discussions among its school administrators and board of education in 1959, there was doubt, despite the fact that most business establishments and late-model cars in the area were increasingly equipped with cooling machinery, that the three-year senior high school proposed for McPherson, Kansas, should be air conditioned. In great part, the apparent reluctance to build a controlled environment into the school may have been a natural outgrowth of the origins, ethnic and otherwise, of the people in that particular section of the country.

Before the Civil War, the future site of McPherson was a way station on the Santa Fe Trail, located on a high, flat plain (elevation 1,495 feet) between the green lines of the Smoky Hill River Valley to the north and the Arkansas River Valley to the south. For many years, the only permanent buildings on the gently rolling land were a ranch and an inn which were the lone beneficiaries of an almost limitless supply of excellent ground water.

During the 1850's, the southern third of the county was settled by German Mennonite farmers who migrated to America via Russia, bringing with them the "Turkey Red" Ukrainian wheat that eventually made Kansas the winter grain center of the Midwest. Almost simultaneously, the northern third of the county was settled by Swedish immigrants, another group of frugal and conservative farmers who brought a considerable talent for cattle-raising.

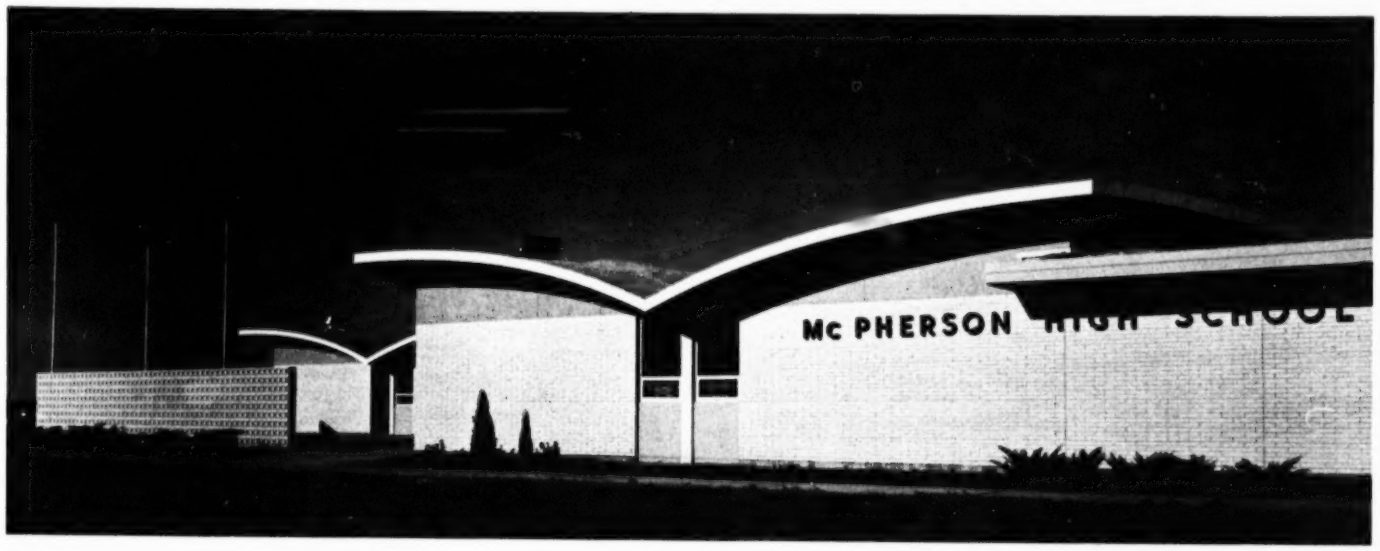
In 1872, the two immigrant groups joined in formally establishing a county seat at McPherson, a small town some 55 miles north of Wichita, named in honor of General John Birdseye McPherson, the commander of the Federal Armies of the Tennessee, who lost his life in the devastating siege of Atlanta.

The subsequent combination of these practical, close-knit settlers with the sporadic influx of homesteaders along the Santa Fe Trail produced a particularly healthy amalgam which persists to the present day; one that has fostered an economy based on wheat, cattle, oil, and light manufacturing, begot a stable population that has grown by less than 200 every year for the past five (county seat residents now number some 10,350), founded a community of families who support 23 churches, two small denominational colleges, a first-rate YMCA, and several good basketball teams every year, evolved a solid Republican electorate that spent $499 a pupil during 1965-66 for public education—only slightly less than the $511 average for Kansas and the $532 average for the United States in the same year—and developed a social temperament that resists change, but tends to accept it wholeheartedly once it has been proven practical.

In the end, resistance to an air-conditioned school of contemporary design was gratifyingly light. There were many good reasons. The summer sun often heats the wheat fields of central Kansas to temperatures in the hundreds, and it was felt, although none of the other public schools in McPherson were air conditioned, that a controlled environment for the new school would not only increase the efficiency of both teachers and students, encourage community use of the building (and its gymnasium in particular), and conform to an advanced standard of school planning, but would also benefit the educational system economically, since the new facilities could be utilized on a year-round basis.

Besides, there was some evidence, even in 1959, that the tenor of the community was changing. Although its economy was still based on agriculture and oil, a growing number of industries, attracted by McPherson's plentiful supply of pure water, were moving into the area, and a slow trickle of newcomers was beginning to dilute the conservatism of the old farm families.

Today, the indications are even stronger. In 1965, industry contributed slightly more than half of McPherson County's total economic resources, and, in 1966, the McPherson Chamber of Commerce began to forecast an accelerating population growth rate, combined with a slightly heightened incidence of transient labor. While the demographic profile of the area is still quite stable, it seems likely that it will become less so in the future.



Obviously, all of these considerations were good and practical reasons in favor of the eventual decision to build a new, air-conditioned high school designed to accommodate 750 students by 1969 and 1,250 within the foreseeable future. And underlying all the rational support may have been something more emotional–the tendency, deep-rooted in farm life, to plan carefully for the future of growing things. But the most important influences of all were those of School Superintendent Joe W. Ostenberg and his assistant, Ted R. Washburn. It was Ostenberg and Washburn who provided the dynamic leadership that moved the McPherson Board of Education to consult the Stanford University Planning Laboratory, which in turn surveyed the needs of the community, recommended a new high school, and developed the forward-looking educational specifications around which architect John A. Shaver, of Salina, Kansas, created a highly compact, economical, and flexible schoolhouse which was intended to satisfy the requirements of McPherson for many years to come.

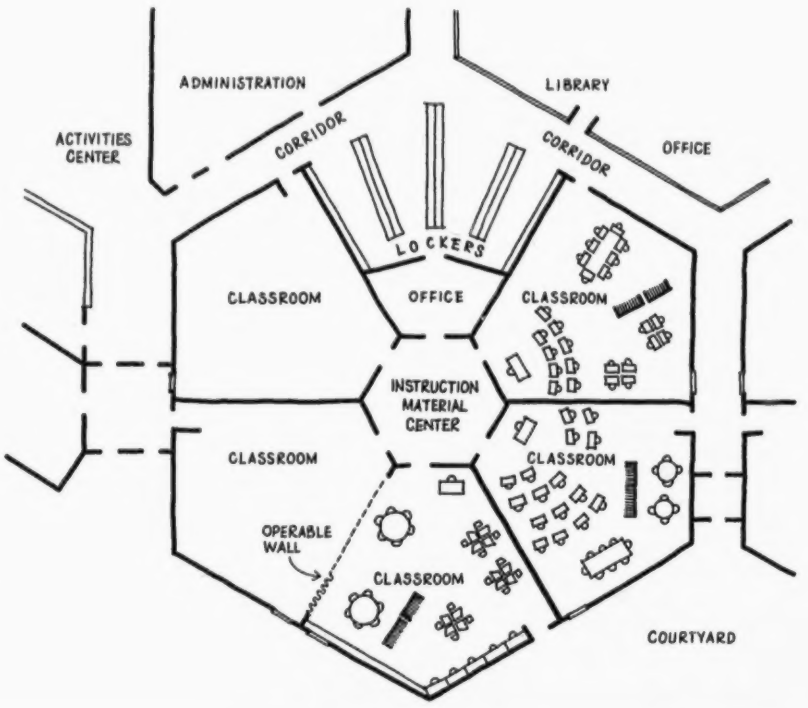
In general, the educational specifications for the new school called for advanced teaching and learning techniques, the use of team instruction in a K-6-3-3 program, extensive utilization of audio-visual aids, resource centers, and flexible space, and an increasing emphasis on availability of choice between college preparatory and vocational training programs.

After considering the architect's presentation of two conventional designs and one that involved a sharp, unconventional separation of study areas from those housing high noise-level activities, the Board of Education approved the recommendation of its Central Committee and the Stanford consultants, i.e., to build the functional structure that Shaver himself favored. It proved to be a wise decision.

Shaver intended, he said, "to design a school around an educational program." He questioned the programs of the conventional high school and the feasibility of the usual rectilinear shape for housing more adventurous programs. In the end, he was finally convinced that he could do better with other shapes.

Shaver's design, a hexagon linked with a circle, was predicated on the concept of clustered space. He felt that the hexagon provided the most economical shape for modular classrooms, and afforded the informality, flexibility, efficiency, and variety that could not be obtained by using rectangular or even circular units. Shaver did use the circle, however, to contain McPherson Senior High School's noisier activities–its gymnasium and shop courses. This strategy offered the double advantage of costing some $6,000 less than a rectilinear structure of equivalent size, and of accommodating, by the addition of a single wall, the school's kitchen, dressing rooms, and all activities associated with a basic program of vocational training.

The results were singularly successful. Viewed from the north side of its 47-acre site on the northeast edge of town, McPher-



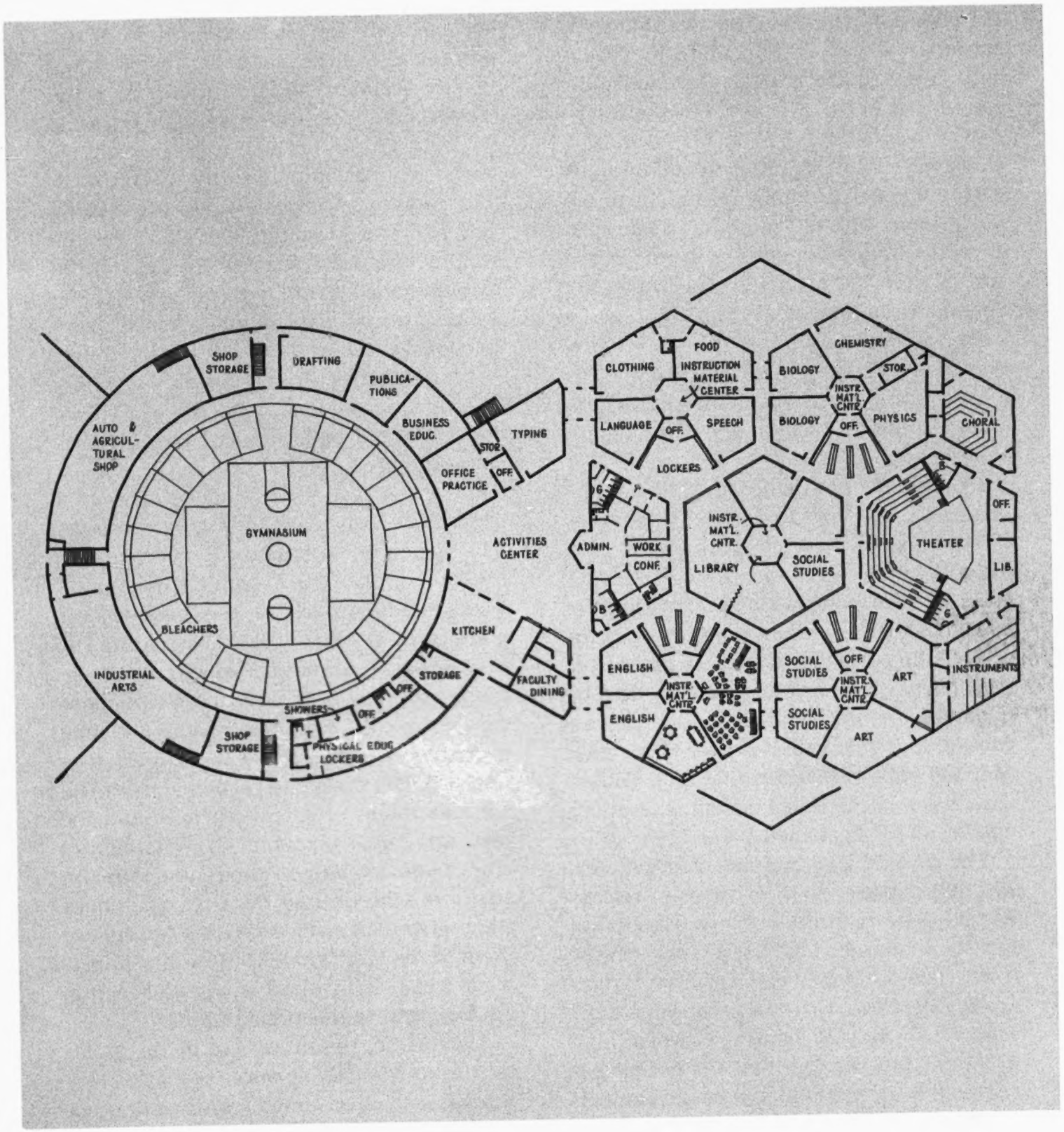
son Senior High School appears as a low, cylinder-surmounted dome—the gymnasium—flanked on the west by a line of prow-like walls—the jutting angles of the classroom hexagons—which are roofed by the gentle wing-arches of their conoidal barrel vaults. The pale yellow brick of the exterior walls is broken by narrow vision strips at the junctures of the roof curves, and by 10 glass doors, 2 of which are shielded by free-standing brick sun-screens that complete the lines of the whole hexagon on the east and west and afford privacy for two small patio-gardens. The general impression is one of serenity and self-sufficiency, made interesting by a variety of shallow curves and angles.

But Shaver's greater achievement lies inside. McPherson Senior High School is an inward-looking building, a group of five and a half 80-foot-wide hexagons clustered around a central, glassed-in library hexagon and linked to the gymnasium circle by a truncated triangle that functions as an "activities center," a foyer, and a cafeteria. Like the larger hexagon that they form, each classroom hexagon looks inward to a smaller one—an instructional materials center, 20 feet wide, that serves the radiating instructional spaces as a resource bank, a specialized branch of the main library, a seminar room, and a distribution point for the centralized plumbing, heating, and air-conditioning systems. A section of each hexagon—the one facing in toward the library and its concentric corridor—is utilized for student lockers and teachers' offices, the latter also opening into the instructional materials centers.

Actually, only four of the five and a half hexagons surrounding the library are devoted to study spaces. The half-hexagon facing in toward the activities center and the gymnasium beyond serves as administrative office space. The full hexagon farthest away from the school's main entrance houses a little theater, which is flanked by band and choral rooms, another aspect of Shaver's foresight in keeping high noise-level activities as far as possible from those devoted to quiet concentration.

The space economies of Shaver's honeycomb design are striking. Since all classrooms are clustered close around the library, and locker areas are removed from the main stream of traffic, Shaver was able to reduce the width of the school's corridors from the usual 12 feet to 8 feet, and cut total corridor space from a conventional 20-22 per cent to a highly efficient 11.4 per cent. Moreover, there are no permanent interior supporting walls, and all concrete block partitions supporting classrooms may be removed to enlarge any given space. The library is an excellent case in point. Although it now occupies only half of the central hexagon—the other half being temporarily assigned to social science overflows—it is expected that it will eventually need to expand into the entire space, a change that will entail only the removal of four concrete block partitions.

And since financial economies usually result from spatial savings, Shaver's care-


SHOP STORAGE
DRAFTING
PUBLICA-TIONS
BUSINESS EDUC.
TYPING
STOR.
OFF.
OFFICE PRACTICE
AUTO & AGRICUL-TURAL SHOP
GYMNASIUM
BLEACHERS
INDUSTRIAL ARTS
SHOWERS
OFF.
STORAGE
SHOP STORAGE
PHYSICAL EDUC. LOCKERS
KITCHEN
FACULTY DINING
ACTIVITIES CENTER
CLOTHING
FOOD INSTRUCTION MATERIAL CENTER
LANGUAGE
OFF.
SPEECH
LOCKERS
ADMIN.
WORK
CONF.
INSTR. MAT'L. CNTR.
LIBRARY
SOCIAL STUDIES
BIOLOGY
CHEMISTRY
STOR.
INSTR. MAT'L. CNTR.
OFF.
BIOLOGY
PHYSICS
CHORAL
THEATER
OFF.
LIB.
ENGLISH
INSTR. MAT'L. CNTR.
ENGLISH
SOCIAL STUDIES
OFF.
INSTR. MAT'L. CNTR.
ART
SOCIAL STUDIES
ART
INSTRUMENTS

ful planning paid off nicely, enabling McPherson's Board of Education to allocate substantial extra funds to educational equipment. When the school was opened in 1963, costs totaled $1,525,000, which included plumbing, heating, air conditioning, wiring, kitchen equipment, and furniture. Since then, $10,000 more has been spent on additional equipment. Still, the school cost only $13.37 per square foot, or $10.00 per square foot calculated on construction costs with air conditioning but excluding furniture and equipment. The average cost of other buildings in the area, with heating and ventilating alone, was $13.90 per square foot.

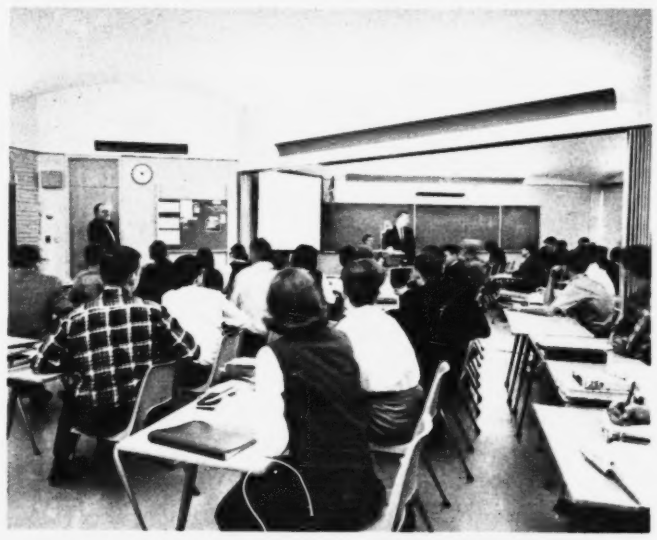
In part, the hexagonal and the circular shapes of the structure saved money by affording a series of repetitive forms capable of being cast over and over again in concrete, and the inclusion of specifications for some $275,000 worth of equipment in the original construction contracts placed the responsibility for its installation directly upon the architect and the builder, a precaution that guaranteed proper fabrication of many built-in features that might otherwise have necessitated fitting alterations which can be very expensive.

The result was a building that contains 114,500 square feet of usable space—24,500 more than the old high school—but is more economical to heat or cool because it has few windows. Fire insurance rates are slightly lower than those for the former school, which now houses a junior high program, and the fact that the building is completely air conditioned almost compels its year-around use. While the other schools in McPherson lie virtually dormant during the summer, the new structure bustles with a growing summer-school program, one in which 387 students were enrolled in 1966.

As efficient as it is, McPherson High School's main asset is not one of economy. Its outstanding feature is the encouragement of experimentation, the envelopment of both students and teachers in an environment of freedom and change, the generation of ideas. By its very design—the size and shape of its classrooms, the inclusion of teachers' offices, the centralization of its library and the decentralization of resources, the clustering of its instructional spaces around special centers, and the architect's deliberate attempt to set aside the right angle and take fullest advantage of the geometry of space—the structure almost forces its occupants to strike out along new paths of learning. The effects of the architecture are felt at all levels, and the fear of change, so often deeply rooted in the architecture of conventional schools, is conspicuously absent. "No way of doing things is sacred," says Principal John Goering. "We've experimented a lot more than we did in the old building, and that alone is worth a lot."

On a less abstract level, one of the chief rewards of Shaver's planning has been the new structure's capacity for nourishing a lively program of team teaching. Originally, a gradual approach to the method was planned by Ostenberg and Washburn. The new school would be opened with a conventional program, they said, and would move slowly toward a two- or three-track system of instruction. Incentives were offered to teachers who wished to participate. Central administration sent two teachers and the assistant superintendent to Colorado to study team teaching methods, and those instructors who utilized the new techniques were given clerical assistants to relieve them of the large amount of routine paperwork which is involved in record-keeping, grading, and course-preparation.

Meanwhile, the influences of the architecture were subtly at work. Teachers were thrown into close contact with each other in the offices of the hexagons, which can accommodate up to six instructors. Three of the classrooms were provided with operable partitions, offering opportunities to combine two 868-square-foot spaces at a time into one 1,736-square-foot room. Operating on the principle, expressed by Ostenberg as "teachers are used less than classrooms," instructors were discouraged from making their headquarters in classrooms, and further inhibited from conventional patterns by providing them with spartan classroom desks, the kind that is equipped with only a single shallow drawer.



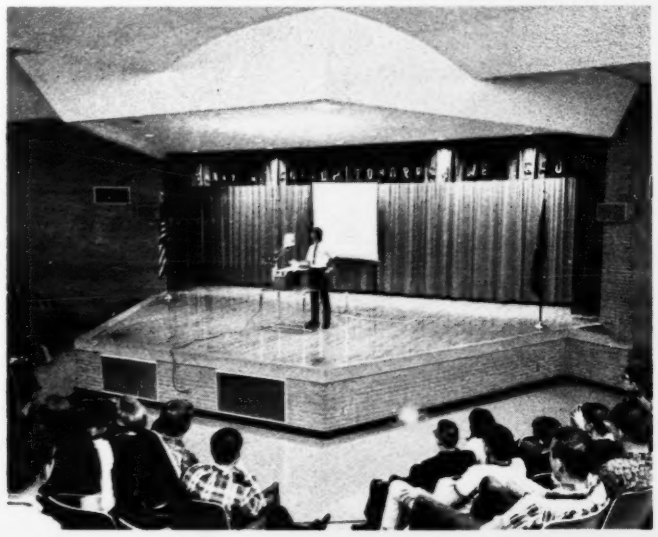
They were virtually forced to use their offices. Moreover, conventional classroom seating was discouraged by supplying each room with a sufficient number of chairs, but varying kinds of work surfaces, i.e., a round table that could be split into two semicircular tables, several trapezoidal desks that could be combined for group seating, and a limited number of ordinary desk-chairs.

Within a short time, the physical environment markedly affected its occupants. Teachers exchanged ideas as they had never done before. Thrown into close contact in their offices, and given one period out of every six for planning, they began inevitably to coordinate curricula and grading techniques, and many adopted new teaching aids after observing their use by more adventurous instructors. On several occasions when new equipment has been introduced by a single instructor, the innovation has set off a deluge of requests by office mates for similar machinery.

Both Ostenberg and Washburn have been adamant in their dedication to flexibility, feeling that the very act of fixing a piece of equipment permanently in place inhibits its use. Soon after the school was opened, one teacher complained to Washburn that he had a shortage of classroom furniture. Washburn asked him if there weren't round tables and trapezoidal desks in the room. The instructor admitted that there were, and was promptly directed to use them. Needless to say, the kind and flexibility of equipment, combined with the unusual shape of McPherson's classrooms, encourages random or peripheral seating arrangements. Seldom does a teacher arrange the tables and desks in a room in straight lines, facing front. In the one case where permanent, conventional seating was installed—the language laboratory—Ostenberg was quite dissatisfied with its efficiency and rearranged the sound-wired study carrels in a peripheral pattern. This has proved to be very satisfactory.

The concept of flexibility extends to even the most basic classroom equipment. Chalkboards, which are green rather than black, and three feet deep rather than four, are clamped into wall brackets and can be adjusted easily for height or moved bodily to any other room in the building. Some rooms are equipped with cork-lined space dividers that can be swung away from a wall to form small areas for specialized work, and the English, mathematics, and social studies hexagons now have folding partitions that can be drawn back to join two classrooms.

In the science hexagon, where chemistry and physics classrooms occupy a section and a half apiece, or 1,302 square feet, laboratory space is immediately adjacent to study space in the same room. This arrangement was designed primarily for the sake of compactness, but it has resulted in a high degree of coordination between theoretical and practical study. Students in these science classrooms can move directly between lecture space and laboratory without loss of time or continuity. "We get fine use of the space," says Washburn, "for things



other than short-range activities."

(Incidentally, another feature of the science hexagon is its separation of physics and chemistry materials storage, an arrangement that saves the school a substantial amount of money by minimizing damage to delicate instruments by corrosive chemical vapors.)

Throughout, McPherson is a school designed for extensive use of audio-visual aids. The wedge shape of its hexagonal classrooms is not only ideal for focusing student attention to the front of the room, but eliminates much of the corner space that would be wasted in a rectangular area. Classroom ceilings, which conform to the arch of the barrel vault roofs, are 12 feet, 8 inches high at the center—sufficient for overhead projection techniques—and lined with blown-on acoustical plaster that lowers the sound reverberation rate to a comfortable level. Lighting in most classrooms is indirect, emanating from trough fixtures around the edges of the ceilings, and rated at an intensity of 30 to 40 footcandles, which the architect considers adequate for studying and writing. The lighting is designed to eliminate glare, it accents the three dimensional aspects of the irregular space and it tends to lend a sense of intimacy, variety, and warmth to the rooms without being bright enough to wash out projected images. Architect Shaver specified open fluorescent lighting only for those rooms where activities call for intense illumination, such as the typing, homemaking, art, and vocational shop areas. He specifically avoided the luminous ceiling type of lighting, which he feels is monotonous and fatiguing.

For the future, McPherson is completely conduited for closed-circuit television, using the little theater as a production center, but several localized sound systems are already in operation. The advanced typing room is equipped with a three-track tape system for dictation purposes; the language laboratory's carrels are individually wired for microphones, earphones, jacks for receiving any one of three tape channels, and an intercom system centered in the instructor's control panel; and the library has 12 study carrels, each of which is wired for two tape channels that can be used either for music or for language study.

In the old high school, the library was little more than a study hall. In the new building, it is the school's intellectual nerve center. Like the rest of the central hexagon, it is surrounded by glass that extends from a 3 foot, 4 inch wall to a height of 8 feet, 8 inches. Most of the library's 12,000 to 13,000 volumes are available on standing shelves, with the rest placed on shelves below the glass. All audio-visual material is catalogued in the library, along with specialized reference books that are loaned out to the various departments. Principal Goering reports that library use has increased tremendously in the new building, and that the concept of decentralization, while not developed to its fullest capacity, has been extremely successful. "There is no question," says Ostenberg, "that library decentralization works. It doesn't make sense to

have a bookkeeper's concept of books."

The 272-seat little theater, on the other hand, has been somewhat less successful in fulfilling its promise. Designed with a thrust stage that is only 25 feet from the last row of the house, and a backstage area that is 21 feet deep and 37 feet wide at the proscenium opening, it has great potential. At present, however, while it is used by community groups for small meetings and fashion shows, by McPherson College for occasional one-act plays, and by the school for infrequent conferences, it is too large for group teaching and too sparsely equipped for varied play production. It is expected that larger enrollments, the development of closed-circuit television systems, and the fruition of McPherson's long-range plans for team teaching will eventually enhance the theater's usefulness. Unfortunately, when the school was built, a highly polished hardwood floor was laid on the stage, obviating its use for set-piece production. Moreover, funds were inadequate to equip the stage with a lighting control panel and an overhead grid—Washburn said that such equipment would have cost an additional $8,000—so that the little theater is now useful only for lectures, readings, and small dramas requiring limited lighting and no scenery. All plays requiring scenery and/or space for large productions are mounted in the auditorium of the old high school, and general assemblies are held in McPherson Senior High School's gymnasium.

The gymnasium, of course, was an important factor in the decision to build a new high school. The town of McPherson takes its basketball almost as seriously as its education and religion, and since the 10 or 12 older gyms in the community were felt to be inadequate for the growing sports audience, it was felt that the new school ought to provide the necessary facilities. The result was McPherson High School's round gymnasium, 155 feet in diameter and 38 feet high at the center of its dome, designed to house two practice basketball courts or one tournament court, usable as space for two simultaneous physical education classes, and equipped with 3,200 bleacher seats that fold back against the walls when not in use. Washburn says that for reasons of economy, it was decided not to separate the two practice court areas with a folding wall, but it was discovered that such a partition was unnecessary, anyway. Boys' and girls' gym classes can be held at the same time in the great circle without interfering with each other in the least.

Providentially, while the gymnasium was being built, school administrators noticed that the contractor had left a large temporary opening in the east wall for his crane. They suggested that such an opening might be needed occasionally to move large scenery or equipment onto the gym floor. Consequently, the opening was made into a permanent door, and the bank of seats in front of it were constructed so that they might be moved out of the way.

It seems superfluous to say that the gymnasium has had heavy use since its opening, by both school and community.

The area surrounding the gym—a concentric ring—contains provision for classes in typing, business education, publications, and drafting; shops for vocational training in agriculture, auto mechanics, woodworking, and printing, with their attendant offices and classrooms; rooms for lockers, showers, and coaches' offices; and a large central kitchen, equipped at a cost of $40,000 to serve not only the high school's needs, but those of cafeterias in the junior high school and an elementary school, functions that involve the daily preparation of 1,600 hot meals and the trucking of food to remote serving tables.

Meals are served to McPherson High School's students (650 are expected during the 1966-67 session) in the activities center that connects the gym and study areas, and students eat in three shifts. During the rest of the day, the activities center functions as a study hall, informal assembly space, and student lounge, particularly favored by students as a gathering place before and after school. Tables and chairs are stacked on dollies and stored out of the way when not in use. When the gym is used for basketball games, the activities center becomes a vestibule where tickets and refreshments are sold. At these times, the hexagon is separated from the activities center by folding steel gates which are on either side of the general office area.

The air-conditioning system for McPherson Senior High School combines a gas boiler and a separate chiller. Its central plant, located at the farthest rim of the gym's perimeter, dispenses cooled or heated air to the gymnasium, little theater, and overhead duct points in each instructional materials center, where it is distributed to the classrooms. Teachers may control the temperature of their individual rooms to vary as much as 10 degrees from the established school temperature. The ducts, as well as other utilities carriers, have been left exposed against the instructional materials center ceilings, for ease of access.

When the study areas are not in use, and the gymnasium is employed for athletic events, the hexagons' air conditioning may be cut off and the full power switched to the gym. The administrative offices are equipped with their own air-conditioning system, and can be cooled separately when the building's central plant is shut down. Obviously, the electricity bill for McPherson High School's 114,500 air-conditioned square feet is higher than that for the old high school's un-air-conditioned 90,000, but the economies gained by year-around use and lower heating costs are considered compensating factors.

From all indications, the major aims of McPherson's planners have been, or give promise of being, achieved. The school building was designed for eventual team organization, the use of varying-size instructional groups, and independent study. Separation of study areas from spaces housing noisier activities, the benefits of instructional space clustered around central resource facilities, high audio-visual potential, good traffic flow, and a fully controlled environ-

ment were important considerations. Compactness and economy combined with aesthetic satisfaction, capabilities for expansion, and an atmosphere of freedom, change, and inquiry were felt to be of primary importance. And so far, every one of these goals seems attainable.

But the planners' most striking achievement is the growth of McPherson's team teaching program. "You couldn't force teachers to use materials and you couldn't force staff interaction by administrative edict," says Ostenberg, but the school building itself has triumphed where leadership alone might have failed. The instructional materials centers bring students, resources, and staff together naturally, and the teachers' offices encourage a healthy exchange of ideas. There is better grading and course continuity, more experimentation, and increased interdisciplinary movement. The team teaching concept still encounters some resistance, mainly from older teachers who are accustomed to operating by themselves, and from those whose personalities conflict ("The weakness of team teaching," says Ostenberg, "is personality."), but these problems are expected to sort themselves out in time.

The important thing is that the building provides opportunities for new approaches, and that in itself is a great accomplishment. "If you provide the capabilities for something different to happen," says Shaver, "many things *will* happen." One of these results, says Washburn, is "a revolution in staff utilization. We never had such planning together." Another is the elimination of traffic jams in front of the student lockers, which are out of the corridors and off the floor, thereby contributing additionally to good ventilation and ease of maintenance. The compactness of the basic design also helps traffic flow and makes it possible to evacuate the building completely in less than a minute.

With all of these excellent features, there are some faults, although not serious ones. Aesthetically, according to Shaver, the glassed-in library has the advantage of offering no opaque barriers to the eye in a fully enclosed building, but some teachers feel that students are distracted from their library work by the sight of corridor traffic passing outside. Moreover, the librarian would like more shelf space, and believes that it could be obtained by reducing the depth of the glass a foot or so, and adding another ledge beneath it. Ostenberg, who likes the comfort and sound-deadening qualities of the wall-to-wall carpet that is now in the library and regrets not having the funds to carpet the entire school, feels that maintenance would be easier and cheaper with such floor coverings. Furthermore, Ostenberg feels that the central offices should have been larger and that the size of the hexagons may have to be increased when additions are made. Principal Goering is looking forward to the day when a proper auditorium is added; Shaver feels that the school's audio-visual potential has not been fully realized because projection screens weren't installed in each room as

original equipment; and a few of the older teachers say that they miss the contact that windows provide with the outside world.

As yet, the gymnasium has not been used as a theater, possibly because the tradition of the proscenium stage is still too strong in McPherson, and there are no plans for an indoor swimming pool, since this facility is provided by the nearby YMCA. But these are trivialities. Everyone, from school administrators to students, seems quite happy with the total effect of the new building. Principal Goering feels that student achievement drives have increased and that the quality of instruction has been raised. Students like the one-floor plan and the air conditioning as much as the teachers, and all are well aware of the lively atmosphere that pervades their school.

Most important of all, there is general agreement that the promise of the new McPherson Senior High School has only begun to be realized. It may be true that much of its efficiency can be attributed to excellence of staff, liberality of administration, and an average class size of 20, but there is no denying the influence of the design itself. "The building," says Washburn, "is still a little ahead of the teachers, but the fact that the equipment is there encourages its use." Juxtaposition, as someone has said, is the world's most effective matchmaker.

McPherson

LOCATION:
McPherson Unified School
District 418, McPherson, Kansas

OPENED:
June, 1963

GRADES:
10-12

CAPACITY:
750 students by 1969,
1,250 within foreseeable future

ENROLLMENT AT OPENING:
550 students

ENROLLMENT AT TIME OF REPORT:
650 students

SUPERINTENDENT:
Joe W. Ostenberg

ASSISTANT SUPERINTENDENT:
T. R. Washburn

ARCHITECTS:
Shaver & Company,
Salina, Kansas/Beatrice, Nebraska

DESIGN:
John A. Shaver

EDUCATIONAL CONSULTANTS:
Stanford University
School Planning Laboratory,
James D. MacConnell, William R. Odell,
Don L. Davis

Nova:

NOVA HIGH SCHOOL, FORT LAUDERDALE, FLORIDA

Although its goals are at least comparable to those of Andrews and McPherson High Schools, Nova was founded under completely different circumstances. Whereas the Kansas and Texas schools were designed to satisfy the requirements of an expanding enrollment, as well as to serve many of the nonacademic needs of their communities, and were largely the result of foresighted planning on the part of school board members and professional administrators, Nova came about through the efforts of a few private citizens and the local school board, in answer to needs that are just as pressing, but perhaps less obvious to the average layman. In particular, Mr. Stuart Synnestvedt, a retired public relations consultant, made valuable contributions to the establishment of the school, first on a voluntary basis and later as an employee.

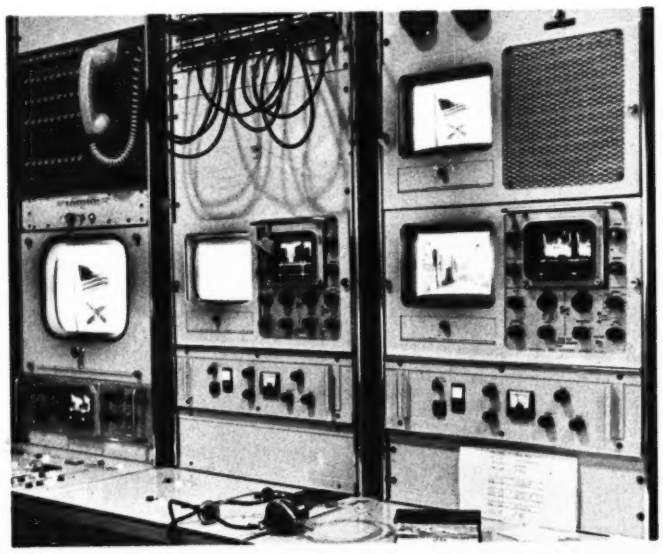
Nova is operated and financed by the public school system of the Broward County area in cooperation with various educational institutions and foundations. It operates on an 11-month, trimester academic schedule, draws students on a voluntary basis from the entire county, requires students to pay for their own transportation, and was built without regard for the recreational or social activities of the community at large.

Furthermore, Nova is part of a master plan for an educational park, a campus which will eventually accommodate not only the high school, but four elementary schools, a junior high school, a junior college, and a full university, all linked by an independent administration and a nongraded program of instruction. Nova thus makes few concessions to public opinion, and is, in effect, a workshop of academic experimentation where ideas may be tried with relative freedom and where no student is accepted without his wholehearted endorsement of the principles upon which it was founded.

In 1961, the school board granted a leave of absence to A. B. Wolfe, the deputy school superintendent in Broward county, and engaged him as director of Nova High School, the nucleus of the South Florida Education Center, to plan and build an educational institution around a most ambitious principle, i.e., "to design and activate an educational philosophy capable of meeting the new demands of a dynamic society in a scientific age." Wolfe responded with a forthright declaration of his educational specifications:

> This center will introduce a system of continuous education from pre-kindergarten through graduate school level; the end result being the maximum attainment of each student's talents no matter how unequal that maximum might be, and more importantly the learning habit in the areas of science, engineering technology and allied vocations may be carried through his adult life as a process of continuous education.
>
> Beginning at a very early age in the education of the child, the program will arouse and cultivate curiosity and the habit of inquiry. It will also create and stimulate an active desire to learn. Instructors will help children learn careful observation, classification, measurement, experimentation, and the skill of seeing general principles which underlie a set of related facts. In short, scientific method will be taught from the beginning as a basic tool for all learning.
>
> There must be a wide departure from the typical school of square classrooms, long cavernous corridors of echoing tile and steel lockers whose furnishings and appointments are totally utilitarian; all of which suggests that the overriding considerations are rigidity and indestructability.
>
> The facilities serving this instructional program will be designed to soften and humanize the environment in which students and teachers work. Redesigned space which can be easily and quickly converted into larger or smaller spaces, engineered sound control, carpeted floors, the wise use of colors and the redesign of furniture and equipment will lend an air of dignity to the learning environment.

The Nova student was not only to be surrounded by an efficient and pleasant learning environment, he was to be confronted, even bombarded, with all possible opportunities for education, including those that could be presented by a wide spectrum of



advanced technological aids. "Nova," wrote architect John M. Hartley in describing his approach to the project, "is a school that was literally designed from the inside out." The fat of the usual high school curriculum was to be cut away, and only the basic bones of intellectual discipline and inquiry left as an intangible structure, around which a highly functional building complex would arise, giving form to a philosophy predicated on the future.

At Nova, there was to be a maximum of useful, flexible, and varied instructional space, but there were to be no frills. Faculty lounges, for instance, were out. "Lounges encourage lounging," said Wolfe. Moreover, all the money that is usually spent on kitchens and cafeterias, tournament-size gymnasiums, olympic-size swimming pools, 2,000-3,000 seat auditoriums, spacious band and choral rooms, and long corridors lined with doors to rectilinear, single-purpose classrooms, was spent on the facilities that Nova's planners felt were indispensable, namely, teachers' offices, planning rooms, clerical space, air conditioning, good lighting, and the most impressive battery of modern audio-visual teaching aids in any school in the country.

Nova's planners were determined not to skimp on instructional hardware. They spent $250,000 of the school's $2,800,000 total cost on it, and the benefits are everywhere apparent. Every one of its 40 major instructional spaces is equipped with a 23-inch television monitor, and 8-inch monitors are spotted in 18 of its resource center study carrels. The closed-circuit system, based in a central control room manned by two full-time television technicians, is capable of piping 10 different programs, to a maximum of 70 stations. Upon request, via direct-line telephone from any teaching station or resource center, control can feed simultaneously two programs from broadcast, two from video tape, one from its mobile camera (plugged in anywhere in the complex), and two from its multiplexer, which can utilize 16 mm movie film, 35 mm slides, and 35 mm filmstrip, to any monitor or combination of monitors. And of course, each station has its own volume control.

Sixty-six classrooms and study carrels are also equipped to receive straight audio material, piped from the control center's 24 tape machines. Retrieval of catalogued audio resources is automated, and students have only to dial the appropriate index number to receive music, language lessons, or lectures recorded by his instructors, through headphones in 23 separate carrels. In the language laboratory, the instructor might channel any one of four audio tapes to each of the 50 booths in the room, as well as communicate directly with individual stations. It is possible, using this system, for the teacher to divide his class into four groups, each of which can receive separate taped instruction while the teacher works with individual students.

To supplement its three resource center libraries, Nova owns a 1000-D Filmsort camera that can be used to photograph printed material, process it for microfilm,

and produce an aperture card which can be key-punched on an electronic data processor for automated retrieval and viewing on microcard readers. A reader-printer reprints microfilm for small study groups.

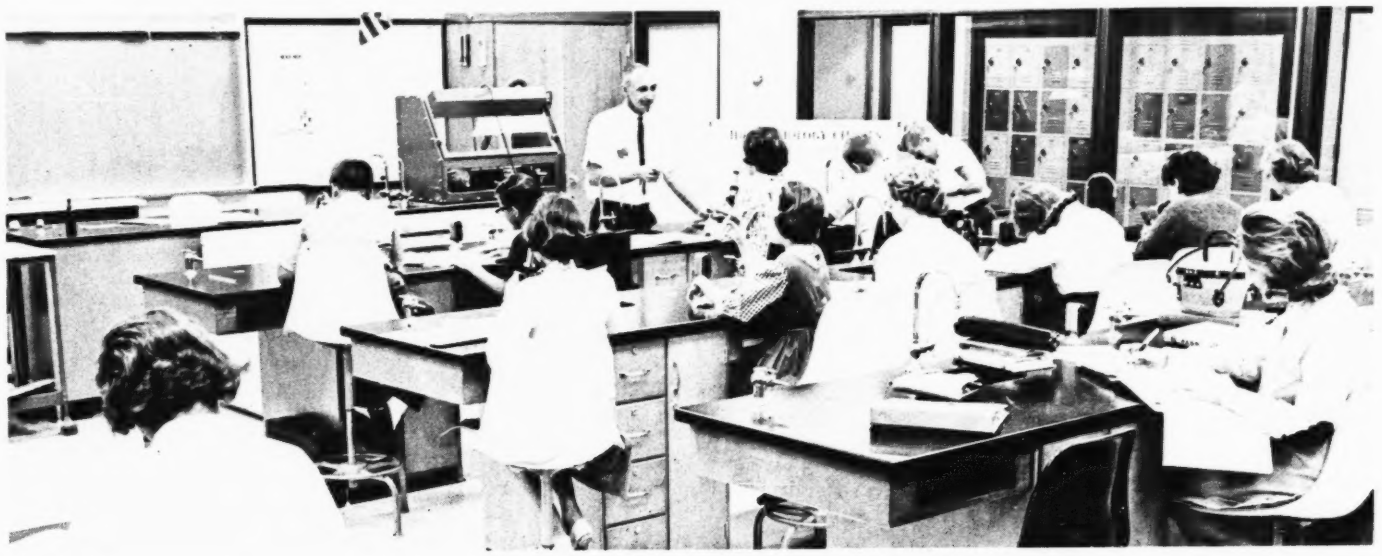
In addition to the customary library resources, Nova's three centers can offer students and teachers film, filmstrip, and slide projectors for showing color transparencies. Tape recorders and record players are also provided for student and instructor use, and 11 of the 21 "dry" study carrels are wired for typing. Moreover, each teaching station is equipped with an overhead projector and a pull-down screen, and instructors may borrow opaque projectors at the resource centers. Nova also maintains a full-time staff, including an artist and technicians, to produce its own visual aids.

The effect of this profusion of audio-visual apparatus is manifold. It not only offers the convenience and efficiency of the most modern teaching and information retrieval methods, and eliminates the need for an auditorium, but it accustoms the student to the use of both traditional and automated resource centers, skills that he will find useful throughout his life. Simultaneously, it enables the instructor to utilize a wide variety of advanced technological aids in his efforts to reach the student. In most cases, the learning process has been deepened and accelerated, and teachers at Nova report that the pace has quickened so strikingly, and the amount of student absorption has so improved, that the instructors find themselves hard pressed to keep up with the increased demand for new knowledge.

In any course, the teacher is likely to give a lecture once a week to a group of 150-200, meet once a week with a middle group (50-60 students under two teachers), and direct two small groups of 15 or under. Middle groups may be separated into small groups or devote the time to independent study or the pursuit of supplementary information. Small groups have seminars or discussion activities related to the lectures. Conferences are usually held with the teacher once every two weeks. At Nova, a teacher is seldom required to lecture or conduct class continuously through the day without a block of time devoted to planning, either individually or with other members of a teaching team.

There has been much apprehension in recent years, among educators as well as laymen, that a proliferation of impersonal teaching aids would gradually replace live teachers and deprive students of individuality. Television, electronic data processing machines, and other technical support, it was feared, would transform the school into a factory where everyone would receive standardized instruction and where no one would be interested in the personalities, capacities, or unique needs of the separate beings in its classrooms.

At Nova, however, where advanced teaching aids are employed in hundreds of learning situations, Director Wolfe and his staff have been able to achieve an intensification of individuality, simply by shifting the instructional responsibility from teacher to



student, and by bending every erg of mechanical energy toward the task of encouraging the student to learn at his own best pace. The result has been greater freedom and a gratifying increase in motivation.

The price of such achievements is time, and since time is education's most expendable, as well as its most crucial, commodity, Nova has been willing to pay it. The academic year has been lengthened to 11 months, the weekday session stretched to 7⅓ hours, and the daily schedule divided into 22 flexible 20-minute modules, or "mods," with no less than two mods per class period and no more than three.

For most Nova students, the academic day lasts from 9:30 A.M. to 4:50 P.M. Extracurricular activities, such as band and choral practice, can begin as early as 8:15 A.M. Open mods are usually spent in one of the school's resource centers, but can be spent in conference with an instructor or in a quest center.

When a student enters Nova he is scheduled into a curriculum designed to satisfy his interests as well as the school's academic requirements. Each of his teachers or teaching teams equips him with a "learning activity package," a detailed "self-study sequence" that amounts to a basic text and leaves instructors free to lecture, prepare materials, or offer personal assistance.

Such a system, combined with a nongraded program of instruction, gives teachers the opportunity to concentrate on enriching their courses, coordinating their efforts, and utilizing the most effective methods for communicating information. Simultaneously, it removes the pressures of regimentation from the student, permits him to fulfill the conditions for graduation without the imposition of an "average" speed, and frees him to range as widely or as deeply as his interests or abilities allow.

Like its educational program, the architecture of Nova is highly functional. At the center of its complex lies a pavilion housing two trapezoidal, 200-seat, divisible auditoriums; one for language lectures and one for science and mathematics. Each hall can be divided, using sound retardant operable partitions, into one 100-seat and two 50-seat rooms, and both are equipped with projection booths and large screens for films, enlarged television images, and other audiovisual aids. Surrounding the auditoriums, and like them covered by the scalloped pavilion roof, is Nova's sunken, split-level student commons, which serves as an outdoor dining and lounging area.

The science building is located on the northern perimeter of the commons. It contains four divisible 50-seat teaching-laboratories; five triangular, 50-place middle rooms for classroom work, including two that can be combined by opening a folding wall between them; a science curator's office and supply room where apparatus is stored and prepared for use in classrooms and laboratories; teachers' planning offices, conference rooms, and clerical space; and the school's television studio and control room, all placed conveniently around a resource center.

On the western perimeter of the commons lies the language building, a square structure housing six middle-sized rooms, two of which are divisible; a 50-booth language laboratory; eight conference or seminar rooms; teachers' planning offices, conference rooms, and clerical space; and a student council and publications room, all, again, surrounding a resource center that contains study, listening, and television carrels, a reading laboratory, and the master catalogue of Nova High School's combined educational resources.

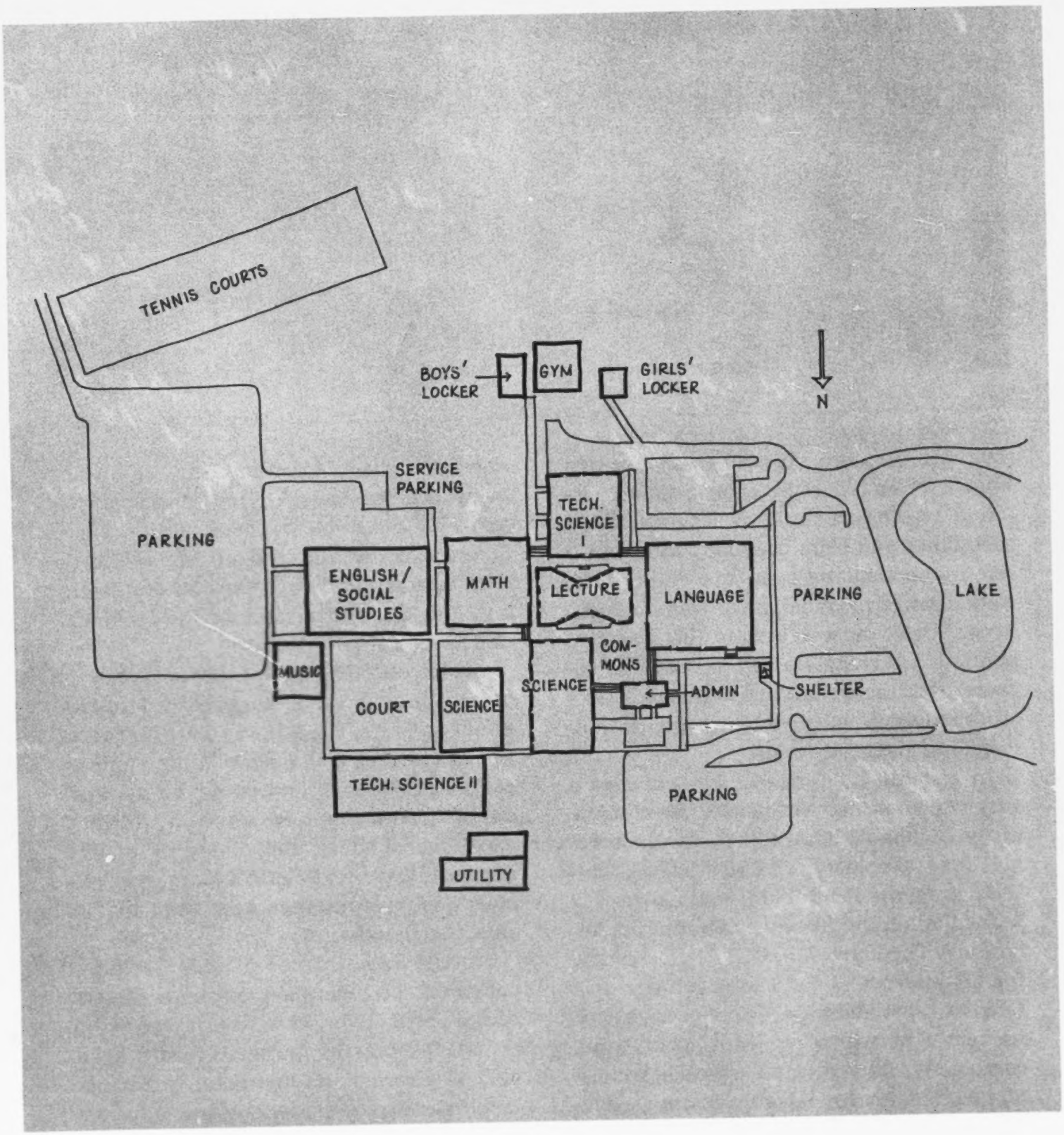
The mathematics building, newest of the four learning centers, is square, like the language building, but somewhat smaller. It projects from the eastern edge of the commons, and contains three 150-student, divisible rooms; three 40-place classrooms; eight conference or seminar rooms; teachers' planning offices, conference rooms, and clerical space; and its particular centralized resource area.

The technical and special studies building, on the southern perimeter of the commons, is the only one of the four learning centers designed without a resource focal point. Instead, it contains large laboratory and teaching spaces devoted to typing and stenography; communications, electronics, and mechanical technology; engineering drawing, art, and home economics; and a small kitchen where meals are prepared for the Nova version of a student cafeteria: four snack bars.

In the fall of 1966, to accommodate expanding enrollments and a growing need for a broadened program of vocational education, Nova started construction of a $1.8 million technical science wing, which will also provide the needed additional space for individual instruction.

Nova's small teaching gymnasium (capable of accommodating 1,000 spectators on folding bleacher seats) and its accompanying locker and shower facilities are located a short distance to the south of the technical and special studies building and are linked to the commons by a loggia. The administration building lies to the north of the center. All buildings except the administration and athletics structures can be reached by crossing the commons beneath its pavilion. The administration center is located between the science and language buildings, on the edge of a landscaped, open courtyard that is actually a northern extension of the commons. A loggia connects it with the pavilion.

The basic shape of Nova High School is rectilinear, with its four air-conditioned, one-floor buildings growing out of a pavilion to form a rough quadrangle or asymmetrical cross. All of its structures are built of reinforced concrete laid on concrete slab, and all walls are curtains of concrete block, faced with brick and stucco. The roofs of the administration building and learning centers are steel truss with a minimum of supporting columns. Exterior walls are relieved by vision strips, rather than windows, and interior relief is provided by a maximum of open space or glass partitioning. Resource centers are separated from


TENNIS COURTS
BOYS' LOCKER
GYM
GIRLS' LOCKER
N
SERVICE PARKING
PARKING
TECH. SCIENCE I
ENGLISH / SOCIAL STUDIES
MATH
LECTURE
LANGUAGE
PARKING
LAKE
COM-MONS
MUSIC
COURT
SCIENCE
SCIENCE
ADMIN
SHELTER
TECH. SCIENCE II
PARKING
UTILITY

their surrounding corridors by four-foot walls, but are otherwise open. Student conference rooms are similarly separated from each other and from corridor traffic, but it was found that the open space above the walls allowed too much noise transmission. Accordingly, those spaces in the language building are being glassed in, and it is expected that the conference rooms in Nova's other buildings will also be fitted with wall-to-ceiling glass partitions.

In general, the Nova design provides a variety of instructional spaces. In any one of the buildings, learning spaces are available for 100 students and 50 students, conference rooms for 5 to 15, and carrels for individual study, listening, viewing, or recording. There are a total of 21 classrooms for 50 students, 3 for 100 (each divisible into two 50-student spaces), 19 conference rooms (4 of which are capable of being combined), 62 individual carrels, and 14 50-place rooms for laboratory work. Additionally, each subject-oriented building affords space which is separated, by 8-foot bookcase-dividers, into individual teacher's planning offices, supplemented by teachers' conference rooms and working space for their clerical assistants.

Some 18,000 square feet, or about 14 per cent of Nova's usable space, is carpeted. Floors in all resource centers, teacher's planning offices, student conference rooms, and some corridors are covered with undyed wool carpet, and the remaining floors are covered with vinyl tile. The acoustical ceiling, which carries Nova's recessed fluorescent lighting fixtures, hangs 18 inches below the structural ceilings and provides an easily accessible overhead utility space. Steel lockers for the students line the corridors adjacent to Nova's three resource centers and the central area of the technical and special studies building.

Architecturally, three aspects of Nova's design directly serve its advanced educational program. The school's teaching facilities, and in particular its planning offices, conference rooms, and clerical accommodations, contribute to an easy, healthy exchange of ideas, the easing of routine administrative and clerical tasks, and efficiency of coordination, research, and instructional activities.

Nova's decentralized library facilities, composed of four open resource centers, complement its impressive array of audio-visual aids, making materials readily available to students and instructors alike, and helping to expose students to a steady bombardment of information and educational stimuli while accustoming them to the use of advanced research techniques.

And finally, a wide variety of instructional spaces, with particular emphasis on individual and small group study facilities, are invaluable aids in implementing Nova's programs of team teaching, non-graded classes, and free inquiry.

Compactness of layout, carpeting of floors, good lighting, acoustical ceilings, pleasantly colored interiors, air conditioning, and a modified loft plan in each building all contribute to the efficiency, comfort,

and aesthetic harmony of Nova's intensive educational environment.

For the most part, students and teachers alike are satisfied with Nova's architecture and hardware. Nova teachers who have also taught in traditional schools now feel that their offices are indispensable, and students do not regard the 11-month year and the 7-hour school day as oppressive, despite the fact that this intensive schedule keeps them in school longer than most students in the rest of the country. In fact, says Director Wolfe, attendance records are better at Nova High School during the summer than they are in the winter.

Director Wolfe and architect Hartley, however, are not content. During the four years that Nova has been in operation, they have learned many things, and are beginning to take measures to incorporate these lessons into their expanding school.

While they feel that Nova's closed-circuit television system obviates the need for a large auditorium, and will probably continue to do so, they have decided that certain other standard facilities must be added to satisfy the needs of the student body, a broadening curriculum, and increased operational efficiency.

As a consequence, a 1,000-seat cafeteria, space for a small court that can be used as a variable amphitheater, and rooms to house band and choral activities will be incorporated in the plans for the new technical science building. "Students enjoy the snack bar arrangement," says Wolfe, "but they would rather have a cafeteria."

Presently, all of the musical activities are accommodated in the pavilion's large lecture halls, but these must be tuned for the acoustics of speech and are not satisfactory for music. It is expected that the new band and choral rooms will not only provide more space for these specialized pursuits, but will also be more favorable for accurate musical production. And since they will be located in an area of high noise-level activities, the band and chorus will be able to practice without interfering with study. Occasional large-scale theatrical productions will be mounted, as they are now, in the auditorium of the junior college.

Moreover, several other features, the result of lessons learned in the present Nova complex, will be incorporated in its annex. Basic among these will be smaller instructional rooms and more of them. "This is our most pressing need," says Wolfe. "Originally, we asked for 24 conference rooms and got only 19. We need 40 more, and we're putting most of them into the annex. We're also putting in eight 900-square-foot learning spaces, completely carpeted and equipped with movable screens to accommodate various size groups." The standard classroom at Nova is 1,020 square feet. "If I had it to do over," says Wolfe, "I'd build only a few that size, but many smaller. I'll never build any more large lecture spaces. We have too many rooms that seat 50. We have 21 and I'd rather have half that number. The idea at Nova is to informalize formal learning. You don't do that with large lecture spaces."

In the present buildings at Nova, it has been discovered that corridor traffic does not move as well as it might, particularly around the resource centers, where student lockers are concentrated. True, the corridor is wider in these places–9 feet 6 inches, rather than the 8 feet of Nova's other corridors–but traffic tends to pile up when classes change and students leaving the resource centers merge with others obtaining books from their lockers. Moreover, the lockers are steel, and the noise of students opening and closing them, particularly where the corridor floors are covered with vinyl, is quite distracting.

Architect Hartley hopes to solve these problems in the new annex by placing the lockers on an outside wall, beneath a loggia, and by using more carpet. Wolfe, of course, hopes to carpet more of his buildings as time goes on. "All areas," he says, "should be carpeted as well as air conditioned. Carpeting is here to stay. Schools are using more and more. Some day it will be standard equipment."

While carpeting has had a desirable acoustical effect in most situations at Nova, other substances have been much less than successful, not only as noise-dampeners, but in the matter of durability as well. This is particularly true of Nova's interior walls, which were originally covered with sand-finish "acoustical" plaster. Hartley reports that it scars easily, especially in the conference rooms, where chairs frequently bump against the walls. Consequently, the walls of the mathematics building were covered with lightweight vinyl. But this, too, has proven unsatisfactory because it punctures easily. Thus, the new building's walls will be covered with smooth finish cement. If his budget had permitted, Hartley says he would have specified pre-finished paneling, because of its mar-resistant qualities.

In contrast to Andrews High School, which imparts a feeling of spaciousness, and McPherson High School, which gives the impression of intimacy without being claustrophobic, Nova has a closed-in quality about it that is not entirely relieved by its glass partitions, low room dividers, or vision strips. Much of this cramped feeling is probably traceable to Nova's relatively low ceilings (8½ feet throughout), long, narrow corridors, and fairly live acoustics, but even more may be caused by its constant, rather monotonous repetition of linear shapes. There is little relief from this mazelike appearance at Nova, where each segment of the complex is a self-contained, closed rectangle containing other self-contained, but somewhat more open, rectangles, and having no obvious links with the world outside. And the monotony is heightened by a certain dullness and lack of variety in its decor, particularly in the mathematics building, where much of the interior surface is monochromatic.

Director Wolfe is well aware of these faults, and plans to correct them in the new building. "We need relief in every space from the closed-in feeling," he says. "This is needed on the inside, but also on the outside. The science building has no windows. That was a mistake. On the other hand, I wouldn't use all-glass areas, which cause all kinds of problems. The students ought to be in a learning environment with as few distractions as possible."

Furthermore, Wolfe is dissatisfied with the desks he bought for Nova. While they are of good quality and quite functional, they are of the traditional type, with a writing surface attached to a chair, and readily lend themselves to the customary rank-and-file arrangement that seems to satisfy the custodial staff's penchant for schoolroom neatness. In the future, says Wolfe, he will buy no more conventional desks. Instead, he favors trapezoidal tables, which militate against stiff, formal arrangements, and can be combined to form various patterns according to the size of study groups and the requirements of various instructors.

In general, however, Nova is a highly successful school, perhaps because its basic philosophy and its educational assets are much more significant and effective than any architecture could be in influencing teachers as well as students. The school's emphasis on the individual and its efforts at making him responsible, self-reliant, and highly motivated have resulted in direct contact, at many points, between education

and the educated. In one instance, Director Wolfe has instituted an expanding program of "quest centers," special rooms in each building where an instructor is always on duty, and where students may go at any time for help in pursuing their studies. In another, he is rapidly decentralizing his administrative staff, placing the personnel responsible for each subject area directly in that space. "We ought to stop putting all administration away in some corner," he says. "Decentralization increases the communications problem, but it's worth it." Obviously, the architect helps these tactics by providing the space for them, but he is not a prime mover.

Nova High School does offer an impressive array of educational facilities. In the end, however, it may not be these facilities, but the basic idea of confronting highly motivated students with as much knowledge as they can absorb—and then confronting them with more—that will set Nova apart from other schools. At this writing, no one knows this for certain, but there is a good possibility that the theory will be tested very soon. This year, the second Nova elementary school opened in an old, abandoned schoolhouse in downtown Fort Lauderdale. There the Nova methods will be applied without the technical assets available in the high school.

Nova

LOCATION:
South Florida Education Center,
Broward County, Florida

OPENED:
September, 1963

GRADES:
7-12 non-graded

CAPACITY:
3,000 students, with annex

ENROLLMENT AT OPENING:
1,500

ENROLLMENT AT TIME OF REPORT:
2,060

SUPERINTENDENT:
Dr. Myron L. Ashmore

DIRECTOR:
Arthur B. Wolfe

ARCHITECT:
James M. Hartley,
Hollywood, Florida

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COLLEGE STUDENTS LIVE HERE. A report on the what, why, and how of college housing; reviews the factors involved in planning, building, and financing student residences.

THE COST OF A SCHOOLHOUSE. A review of the factors contributing to the cost and effectiveness of schoolhousing, including planning, building, and financing.

DESIGN FOR ETV—PLANNING FOR SCHOOLS WITH TELEVISION. A report on facilities, present and future, needed to accommodate instructional television and other new educational programs. Prepared for EFL by Dave Chapman, Inc., Industrial Design.

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THE SCHOOLHOUSE IN THE CITY. EFL'S annual report for 1965 and an essay on how the cities are designing and redesigning their schoolhouses to meet the problems of real estate costs, population shifts, segregation, poverty, and ignorance.

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DRAWINGS: *Natalie Siegel*
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PRINTED: *Georgian Lithographers*